THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

COMPUTERWORLD

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Interview with software metrician and author Lowell Jay Arthur **45**

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Processor blitz strikes high end

Burroughs adds CPUs

A 15 rivals IBM 3090; V series debuts

By Tom Henkel
CW Staff

NEW YORK — Continuing the year-long rehabilitation of its mid-range and high-end systems, Burroughs Corp. last week matched the performance of IBM's high-end 3090 mainframes with the eight-model A 15 line. The company also took the first steps toward replacing its B2000, B3000 and B4000 series processors with the V series machines.

The following are highlights of last week's announcement:

- The A 15, which reportedly performs an average of 2.6 times faster than the company's previous high-end processor, the B7900. The A 15 line includes one-, two-, three- or four-CPU configurations and occupies roughly 45% less floor space than the B7900.
- The V 340 and V 380, which are successors to the B4925 and B4955 mid-range processors. Burroughs claimed the two processors are the first in a line that will eventually replace its B2000,

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Bunch companies counterpunch IBM's Sierra to keep Big Blue from their top accounts. Analysis on page 10.

Honeywell launches top-of-the-line DPS 90

By Tom Henkel
CW Staff

PHOENIX — Displaying the first fruits of its year-old relationship with Japan-based hardware manufacturer NEC Corp., Honeywell, Inc. last week unveiled its most powerful mainframes to date. The DPS 90 is a five-model processor line said to offer performance comparable to IBM's recently announced Sierra CPUs.

In addition to the mainframe line, Honeywell announced the following:

- A mass storage subsystem that is based on IBM's 3380 disk drives, three magnetic tape processors and an enhanced version of its mainframe belt printer for the DPS 90 line.
- Enhancements to the firm's DPS 6 line of minicomputers, including the 32-bit DPS 6/85 and the 16-bit DPS 6/42. Honeywell also unveiled two fixed-disk mass storage devices with capacities of 132M and 413M bytes for the DPS 6 line.
- Communications software for the DPS 6 that allows the sys-

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TOP OF THE NEWS

Run for the money. When fear of mass withdrawals forced 71 Ohio banks to close, ATMs were brought down statewide for the first time. **Page 6.**

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Cullinet and Lotus targeted the information center with a system that links Cullinet data base products to Lotus' 1-2-3 and Symphony. **Page 14.**

■

Having reservations. The Justice Department may seek divestiture of airline reservation systems if they are found monopolistic. **Page 15.**

■

Despite a plunge in profits, Wang said it will still unveil products in the coming months. **Page 77.**

AT&T unveils desktop Unix PC

By Eric Bender
CW Staff

NEW YORK — AT&T Information Systems celebrated its first birthday in the commercial computer arena last week by introducing a desktop Unix-based microcomputer, enhancements to the AT&T PC 6300 personal computer, a twisted-pair local-area network and a touch-screen voice/data terminal.

The announcements underline AT&T's intentions to emphasize connectivity between various computer and communications workstations and to provide customers with upgrade paths, according to James Edwards, AT&T Information Systems' Computer Systems president. "There is very little 'value-added' that even AT&T can bring to the marketplace if we do it box by box" rather than by providing networking with a range of communications options, Edwards said.

The following are among the debuts:

- AT&T called its much-rumored Unix PC a "next-generation" desktop system that integrates computing with voice/data communications. The machine is built around a 10-MHz Motorola, Inc. 68010 microprocessor with virtual memory capabilities and offers multitasking, multiuser operation under AT&T Unix System V. A software shell provides a bit-mapped windowing environment, complete with mouse and icons, and isolates inexperienced users from Unix, AT&T said.

See **AT&T** page 13

IBM unwraps fault-tolerant processor line

By James Connolly
CW Staff

RYE BROOK, N.Y. — IBM made official its plunge into the fault-tolerant market last week with the announcement of a system based on Stratus Computer, Inc. Stratus/32 superminicomputers.

IBM is introducing its System/88 just a month after the announcement of an OEM agreement providing IBM nonexclusive remarketing rights to various Stratus products. According to some industry watchers, IBM's move could provide a boost for smaller companies fighting to enter the fault-tolerant transaction processing field while hurting the industry leader, Tandem Computers, Inc.

The three models of the System/88 will be targeted to industries requiring uninterrupted on-line service, including banking, retailing and manufacturing, according to IBM. The System/88 reportedly utilizes the Stratus/32 processor and Stratus VOS operating system, under the name System/88 Operating System. The balance of the system, such as disk and tape drives, controllers and consoles, is composed of IBM peripherals.

Details such as performance figures for the System/88 were unavailable. However, a Stratus spokesman said the three versions of its Stratus/32 run at 0.7, 2 and 3 million instructions per second.

The entry level IBM system is the System/88 Model 4576-20, consisting of two processor modules, duplex 4M-byte sets of memory, a 20-slot chassis, a 1600/3200 bit/in. tape drive, two 143M-byte disk drives, an IBM Personal Computer as a console, and eight communications lines, supporting asynchronous and synchronous communications. A typical configuration costs $157,670.

The mid-range System/88 Model 4576-40 also has duplex 4M-byte processor modules, a 40-slot chassis, 32 communications lines and four 448M-byte disk drives. A typical system costs $437,840.

The high-end System/88 Model 4576-60 is a duplex 8M-byte system with dual disk, tape and communications controllers, six 448M-byte disk drives, two tape drives and 31 lines. It costs $672,000.

See **IBM** page 6

NEWSPAPER

IBM predicts profits will decline

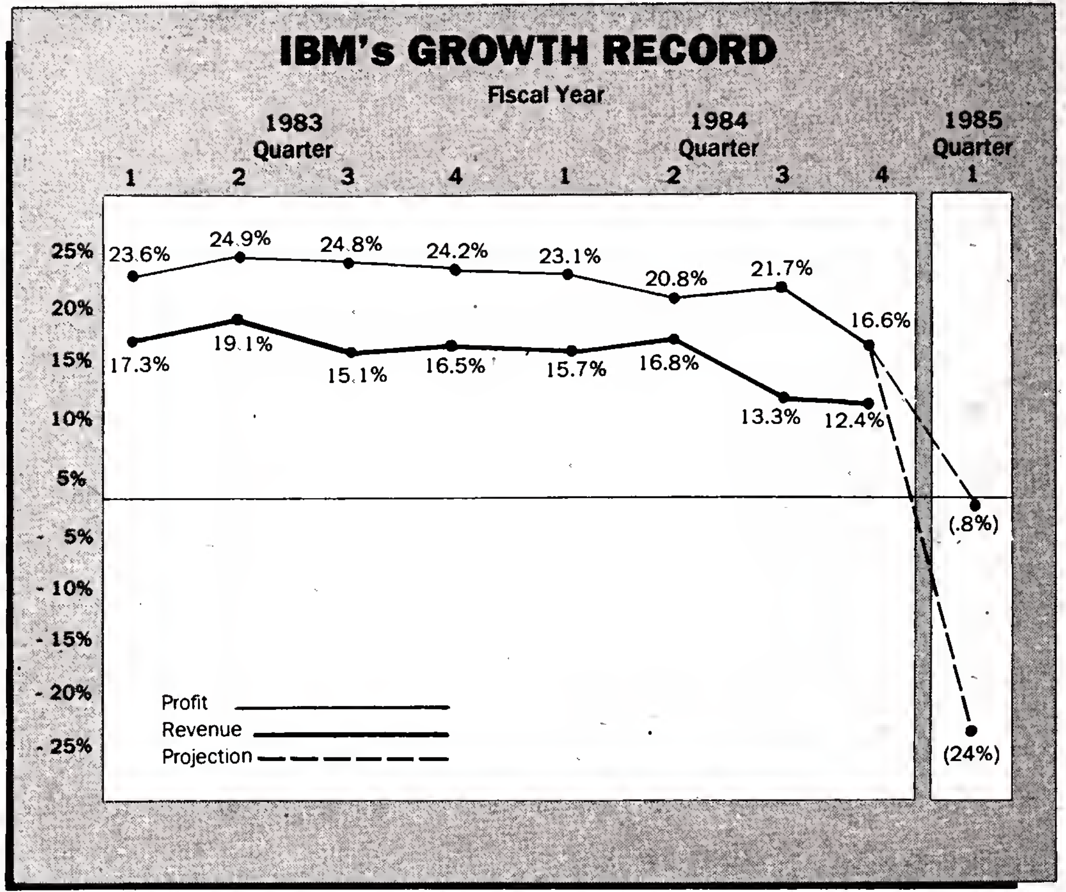
Company blames value of dollar overseas for first dip since 1981

By Peter Bartolik
CW Staff

ARMONK, N.Y. — IBM recently announced that it expects the first quarter of 1985 to produce the company's first drop in profits since the last quarter of 1981. Earlier this year [CW, Feb. 18], IBM had said it expected flat profits for the quarter ended in March.

IBM said further that it is "comfortable" with securities analysts' estimates projecting first-quarter earnings per share in a range from $1.50 to $1.96 per share. That range would produce profits ranging from $917 million at the low end to $1.19 billion at the high end, compared with $1.2 billion reported in the first quarter of 1984.

In a statement, the company said that despite the short-term decline, its customers have responded to recent product announcements by going ahead with their installation plans.



CW CHART

Figures for the first quarter of 1985 represent a projected decline based on Wall Street analysts' estimates, a range with which IBM said it is "comfortable." IBM reported that despite the short-term decline, customers have responded to recent product announcements by going ahead with their installation plans.

Growth for year

"The resulting increase in product shipment rates will make a substantial contribution to the second half of 1985, leading to solid growth for the year as a whole," according to the company.

As it did in February, IBM again attributed the lower earnings to the strength of the U.S. dollar in international currency markets and a hesitation by customers to order large systems prior to the announcement of the 3090 series mainframes.

Despite a flood of downward revisions by minicomputer companies, IBM indicated it has not suffered any setbacks in orders for medium-scale processing equipment. "Orders have been quite good across the product line, and we see no discernible trend," an IBM spokeswoman reported.

Weak technology stocks

Michael J. Geran, an analyst with E. F. Hutton Group, Inc., said he lowered his first-quarter earnings-per-share estimate from $1.97 to $1.65 but only lowered his estimate of fiscal year 1985 earnings per share by 5 cents to $11.75; in fiscal year 1984, earnings per share were $10.77.

At the New York Stock Exchange, on the first day of trading following IBM's announcement of the 3090 series mainframes, the company's stock dropped to $3.25, and analysts said the weakness in technology stocks was causing investors to abandon the market.

Because IBM has reduced its income from rental equipment, Geran said, the company needs to boost shipments by 25% to increase profits by 15%.

"That won't happen until the second half," according to Geran, when IBM will ship its double-density 3380 storage systems and will resume shipments of 3080 series mainframes as well as the initial shipments of the 3090 Model 200 mainframes.

Wohl to pen CW column

Feature to target end-user concerns

Amy D. Wohl joins *Computerworld* this week as a regular columnist.

In her bimonthly "Wohl Street Minijournal," this insightful — and sometimes outspoken — industry watcher will discuss the issues and technologies that make end-user computing a major area of concern for today's management information systems executive.

In late 1984, the noted speaker, writer and commentator on every aspect of computers in the front office founded Wohl Associates, a consulting company headquartered in Bala-Cynwyd, Pa., that specializes in office automation and end-user computing.

Prior to that, she spent five years as president of Advanced Office Concepts Corp., an office automation firm in Bala-Cynwyd. Wohl's experience also includes a five-year stint as an executive editor and consultant with Datapro Research Corp. in Delran, N.J.

Wohl received a bachelor's degree in economics from La Salle College in Philadelphia and a master's degree in the same area of concentration from Temple University, also located in Philadelphia.

CORRECTIONS

IBM announced the reassignment of Philip D. Estridge, formerly president of the Entry Systems Division, on March 12, not Feb. 12 as was reported [CW, March 18].

GTE Data Services, Inc. [CW, March 18] is a subsidiary of GTE Corp., not of GTE Telenet Communications Corp. as was previously reported.

We're looking for hot tips

Hard as we try to give our readers the most complete information available, some good news and feature stories never reach us.

Are you involved in an unusual application of DP technology in your company? Have you implemented successful cost-cutting strategies?

Is something in your DP shop not working as it was designed? Know any unsung heroes in the industry? Heard any hot news about vendors? Are you aware of technology or management trends the trade press is overlooking?

If so, we'd like to hear from you. *Computerworld* has established a reader hot line for information regarding items of interest to the computing community.

Call us toll free at (800) 343-6474. Ask for Donovan White, assistant managing editor.

We can't be everywhere — but our readers are.

NEWS SUMMARY

In addition to announcing a line of mainframes, Honeywell offered enhancements of its DPS 6 line of minicomputers/**5**

The closing of 71 Ohio savings and loan institutions had a minimal impact on regional data centers serving the banks, but one manager said the required shutdown of the banks' ATMs set a precedent/**6**

Private-line users may have a difficult time unraveling AT&T's new rate structure/**11**

Compaq announced a personal computer/communications workstation/**12**

Cullinet Software and Lotus have announced the Information Center Management System/**14**

The U.S. Department of Justice is monitoring a new form of bias in computerized airline reservation systems/**15**

A group of optometrists had some enlightening advice on how to avoid eyestrain from VDT-related work/**17**

A bill before the Florida legislature would allow residents to tap into state electronic records/**19**

An Arizona county government has voted to end its three-year relationship with an independent DP services contractor/**22**

A software package may lead Dade County, Fla., investigators to a man who is believed to have raped 40 women/**24**

On-line commercial finance software has yielded greater efficiency for the subsidiary of a Rhode Island bank/**24**

End-user terminal testing helped determine an insurance firm's DP department's purchasing choice/**30**

With the help of a manufacturing planning system, the world's largest bootmaking firm is striding toward improved operations and lower costs/**32**

A nationwide chain of seafood restaurants is using mainframe computer-aided design software to blueprint its shops/**36**

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SUSPENSE

How did IBM's rookie sort (Rel 7.0) do in its first meeting with "Lefty" SyncSort? Read all about it!

or Call (201) 568-9700.

Get the inside scouting report.

It is one of those historic moments in the Annals of Sort! The very first appearance in competition of IBM's new DFSORT, Release 7, in the tough-as-nails MVS/XA League. Will the kid be able to live up to his advance press notices?

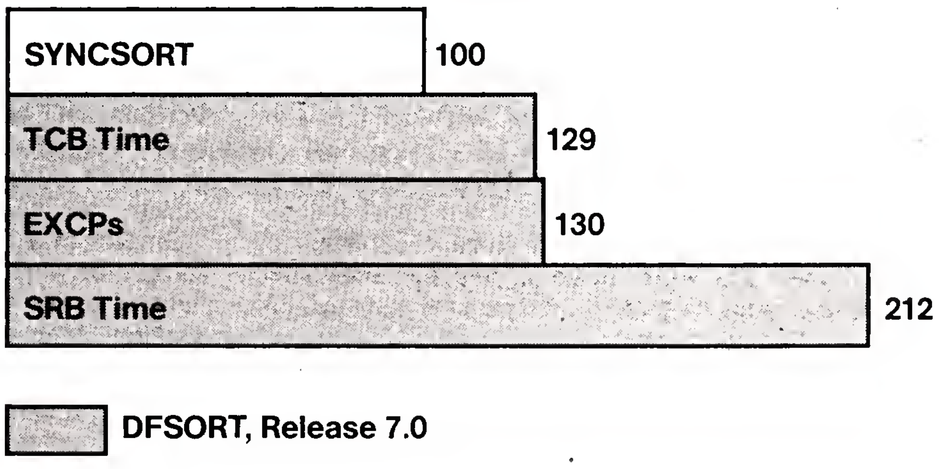
Confidently DFSORT7 strides to the plate... knocks the dirt out of his spikes... hitches up his britches... raises his sort assists.

Then, as sorting fans everywhere gasp in amazement, he lifts his arm lazily and points toward the centerfield flagpole, thousands of bytes away. The kid is going to try to emulate Babe's mighty homerun shot!

Moments later, SyncSort winds up... a curving white blur is seen... and... and...

There is no joy in Armonk! DFSORT7 struck out every time it came to bat against the latest release of SyncSort (Release 2.SE) in a recent series of MVS benchmark tests. (In sorting, as in most other forms of human endeavor, it's a long way from *baby* to *Babe*.)

The bar charts below tell the story more eloquently than we can:



That didn't surprise us too much. **After all IBM isn't known for its sorts... and we're not known for our computers.**

We stick to what we do best. Maybe some day they will too. But in the meantime, you're faced with a choice of sorts. You can use their sort, which gets the job done (eventually). Or you can use our sort. We're a little faster. (We're also very modest.)

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INC.

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FRUITS from page 1

tem to coexist with an IBM System Network Architecture environment.

Based on NEC's S-1000 CPU, the DPS 90 line consists of one-, two-, three- and four-processor configurations and a redundant dual-processor model.

Honeywell said the uniprocessor DPS 90/91 offers from 30% to 70% more performance than the uniprocessor version of the older DPS 88/81. That means the DPS 90/91 offers internal performance of roughly 10 to 12 million instructions per second (Mips). The DPS 90/92 and DPS 90/92T offer 1.8 times the performance of the DPS 90/91, and the DPS 90/93 offers 2.6 times the performance of the Model 90/91. The four-processor DPS 90/94 is said to offer 3.4 times the internal performance of the DPS 90/91, or roughly 34 to 41 Mips.

The basic DPS 90 configuration consists of modular components including a CPU, a system control unit, a main memory unit, an I/O processor, a power supply unit, a system console and an interface adapter unit that allows users to connect peripherals that conform to the Federal Information Processing Standards guidelines.

The DPS 90 was designed to use Honeywell's Gcos 8 operating system, and software designed to operate under Gcos 8 on the older DPS 8 and DPS 88 mainframes will operate without change on the DPS 90 line.

Honeywell said the DPS 90 systems have integrated array processing capabilities that allow the system to operate in scientific environments. To augment this capability, Honeywell said it will offer an enhanced release of Gcos 8 that includes a Fortran compiler designed to take advantage of the system's array processing capabilities.

Available in late 1985, the DPS 90 reportedly will use current mode logic circuitry. The one-, two- and three-processor models are field upgradable to the four-processor model, but users of other Honeywell systems, such as the DPS 8 and DPS 88 mainframes, cannot field-upgrade to the newly announced models.

Main memory ranging from 32M to 256M bytes is supported on the DPS 90 line. However, a maximum of 128M bytes of main memory is supported on each system control unit/main memory unit cabinet. Consequently, the uniprocessor DPS 90/91 and dual-processor DPS 90/92 support 32M to 128M bytes of main memory. The redundant dual-processor DPS 90/92T, DPS 90/93 and DPS 90/94 support from 64M to 256M bytes of main memory. The DPS 90 is the first Honeywell mainframe to offer 256K-bit memory chips, and memory enhancements are available only in 32M-byte increments, which cost $400,000 each, Honeywell said.

A DPS 90/91 processor with 32M bytes of main memory costs $4 million. The dual-processor DPS 90/92 with 32M bytes of main memory costs $5 million. The redundant dual-processor configuration costs $6.3 million for a 64M-byte capacity. A three-processor DPS 90/93 with 64M bytes of main memory costs $7.3 million. The DPS 90/94 with 64M bytes of main memory costs $8.4 million.

Honeywell's Large Computer Products Division can be reached through P.O. Box 8000, 13430 N. Black Canyon Highway, Phoenix, Ariz. 85066.

HONEYWELL, INC.

System	DPS 8/70	DPS 88/81	DPS 88/82	DPS 90/91	DPS 90/92	DPS 90/92T	DPS 90/93	DPS 90/94
Relative Performance[1]	107-385	329	470	493	887	887	1,281	1,676
Mips[2]	1.8-7.2	7.2	13	10.8	19.4	19.4	28	36.7
Memory size in bytes (Minimum-Maximum)	4M-64M	16M-64M	16M-28M	32M-128M	32M-128M	64M-256M	64M-256M	64M-256M
Purchase Price (Memory Size)	$700,000[3] (2M)	$2,850,000 (16M)	$4,050,000 (32M)	$3,950,000 (32M)	$5,000,000 (32M)	$6,250,000 (64M)	$7,300,000 (64M)	$8,350,000 (64M)
Lease Price (Lease Term)	$38,094 (5 Year)	$91,200 (4 Year)	$141,000 (4 Year)	$183,721 (4 Year)	$232,558 (4 Year)	$290,698 (4 Year)	$339,535 (4 Year)	$388,372 (4 Year)
Machine Cycle Time (Nsec)	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
Channels (Minimum-Maximum)	108	10-40	10-40	16-48	16-48	16-48	16-48	16-48
Cache (Buffer) size	32K	64K	128K	32K	64K	64K	96K	128K
Bus Architecture?	No	No	No	No	No	No	No	No
Price per 1M byte of main memory	$20,000	$20,000	$20,000	$12,500	$12,500	$12,500	$12,500	$12,500

1. CW estimates based on vendor-supplied information. Relative performance ratings are based on an IBM 370/158-3 equaling 45. These numbers are designed to put the processor into perspective with other systems; they do not constitute a buyer's guide. All systems are not alike; they use different operating systems, instruction sets and architectures and, therefore, cannot be directly compared. In addition, actual relative performance may vary with the application, peripherals and software.
2. CW estimates.
3. For the processor only. Each of the models in the DPS 8 line can accommodate multiple processors.

CW CHART

Disk, tape, printer products round out Honeywell debuts

PHOENIX — To support its newly announced DPS 90 line of mainframes, Honeywell, Inc. unveiled a mass storage subsystem, a line of magnetic tape processors and an enhanced version of its mainframe-oriented belt printer.

The PSP3880 series mass storage subsystem is based on IBM's 3380 disk drives, sold to Honeywell via an OEM agreement reached with IBM in late 1984. The subsystem consists of a mass storage processor and one or more mass storage units. Each mass storage unit has two fixed-head disk assemblies and provides a total storage capacity of 1.85G bytes. The units have an average seek time of 16 msec and a peak data transfer rate of 3M byte/sec, the vendor said.

Honeywell said it is also offering the disk subsystem to users of the DPS 88 processor line.

A mass storage subsystem consisting of a dual-access controller, two head-of-string disk drives and two slave drives costs $380,000 and will be available in 1986.

Also announced were the MTP8021, MTP8022 and MTP8033 magnetic tape processors. The units connect to high-speed data channels via the bidirectional I/O data transfer paths under control of Honeywell's Gcos 8, Multics or CP-6 operating systems. The tape processors control the transfer of data to and from up to eight tape drives.

Single- and dual-channel controllers support a variety of peripherals. An optional dual simultaneous channel feature can be used to increase data transfer efficiency and support up to 16 tape drives, the vendor said.

The MTP8021 is a freestanding primary channel unit that operates at 1.6K to 6.25K bit/in. MTP processors were designed for installation into the MTP8021. A tape subsystem consisting of a controller and eight tape drives costs $195,000.

Honeywell also enhanced its mainframe belt printers to support a parallel interface for use with the DPS 90. The units previously were available with a serial interface. The PRU0908 and PRU1208 printers operate at 900 and 1,200 line/min and cost $35,000 and $38,000, respectively. A $28,000 controller and channel attachment are also required. Current users of the belt printers with a serial interface can upgrade the units to accommodate a parallel interface for $3,000.

Honeywell's Large Computer Products Division can be reached through Box 8000, 13430 Black Canyon Highway, Phoenix, Ariz. 85066.

DPS 6 software gets IBM SNA link

WALTHAM, Mass. — Honeywell, Inc. has added an Application Interface Facility (AIF) to its line of DPS 6 networking software that allows the DPS 6 to communicate with IBM processors operating in an IBM Systems Network Architecture (SNA) environment.

The facility enables user-written DPS 6 Cobol or assembler programs to establish application-to-application communications links with programs executing under IBM's CICS transaction processing monitor or IMS data base management system.

The facility has an initial license fee of $485 and an annual fee of $155, the company said.

In announcing the AIF package, Honeywell said that it is bundling most of its SNA-related software packages for the DPS 6 into one package called the SNA6. This package includes all but the IBM-resident parts of the DPS 6 SNA file transfer software. Designed for use on DPS 6/22 through 6/95 systems, the SNA6 package operates under Honeywell's Gcos 6 Mod 400 operating system.

The SNA6 package has an initial license fee of $3,755 and an annual fee of $1,655. An SNA File Transmission package for an IBM host costs $4,555 initially and $2,000 for the annual fee.

Second-class postage paid at Framingham, Mass., and additional mailing offices.

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Honeywell adds pair of minis, storage units to DPS 6 line

WALTHAM, Mass. — In addition to unveiling a line of high-end mainframes, Honeywell, Inc. enhanced its DPS 6 line of minicomputers.

Announced were the following:

■ The DPS 6/85, an entry-level 32-bit minicomputer said to offer two-thirds the performance of the top-of-the-line DPS 6/95. The DPS 6/85 is geared for use in heavy transaction processing and distributed processing environments and is field-upgradable to the larger DPS 6/95. It offers a main memory capacity of 4M bytes and a total disk capacity of 3G bytes. The unit costs $57,000 and reportedly will be available in June.

■ The 16-bit DPS 6/42, a 32-user system designed for use in warehousing, distribution and manufacturing environments or as a nodal processor in Honeywell or IBM networks. The system can support up to 2M bytes of main memory and 3G bytes of mass storage. It is priced at $19,300 and will be available in June.

■ Two mass storage devices for currently marketed DPS 6 models. The mass storage devices offer 132M or 413M bytes of formatted storage, respectively, and employ Winchester-type fixed media disk drives with multiple sector read/write capabilities, automatic track and cylinder switching and the ability to perform simultaneous seek operations on up to three other units during data transfer to another unit. Up to eight of the newly announced disk drives — in either capacity — can be linked to the DPS 6/42 or DPS 6/85 systems. The 132M-byte disk unit costs $14,500, and the 413M-byte unit costs $21,000. Both units will be available in June, the vendor said.

■ A 9-track, dual-density tape subsystem was announced for the DPS 6 that is said to offer 6.25K bit/in. group-coded and 1.6K bit/in. phase-encoded recording capabilities. The unit contains a 128K-byte buffer that allows data to be transferred to the CPU at channel speeds. The unit and accompanying controller cost $23,900 and will be available in June.

A tabletop streaming tape drive was also announced. The ¼-in. tape unit has a 64M-byte formatted capacity. It was designed to back up small disk files and can be used with any appropriately configured DPS 6 or Honeywell Level 6 Megabus system. The tape unit can be panel-mounted in Honeywell's Microsystem 6/10 microcomputer or the DPS 6/22 minicomputer. It costs $4,600 and will be available in June.

■ Enhancements to the Microsystem 6/10 microcomputer include a doubling of the unit's main memory capacity from 512K bytes to 1M byte, an increase in the integral mass storage from 20M to 56M bytes and a color graphics display and graphics printer. The enhanced version is available immediately and costs $6,995.

Honeywell announced the products through its Small Systems Group, 20 Smith St., Waltham, Mass. 02154.

Trilogy set to buy Elxsi

CUPERTINO, Calif. — Trilogy Ltd. said last week it has reached an agreement in principle to acquire Elxsi, a privately held manufacturer of large multiprocessor systems, and intends to merge the operations of the two companies.

The merger, if approved by shareholders, will provide Trilogy with its first commercial product. Founded in 1980 by Gene Amdahl, Trilogy raised more than $270 million in financing from various sources in an attempt to develop wafer-scale integrated semiconductors and to build a high-performance IBM-compatible computer based on the semiconductors.

Both projects were scrapped last year. Amdahl, who founded Amdahl Corp. following a successful career with IBM, said recently that the complexity and scope of the projects were too vast to be completed within the designated time frame [CW, March 25].

Under the terms of the agreement with Elxsi, Trilogy will issue or reserve for issuance to Elxsi shareholders about 38 million new shares in Trilogy, which would give Elxsi shareholders slightly less than 50% of Trilogy and significantly dilute the holdings of Trilogy's earlier industry backers. Digital Equipment Corp., Sperry Corp. and France's Bull all made significant investments in the company, but both DEC and Sperry have since made accounting provisions to write down large portions of their investments.

Elxsi, based in San Jose, Calif., last year began marketing systems targeted at the engineering and scientific markets. It has an installed base of more than 40 machines and in 1984 generated sales of $18 million while posting a loss of $7 million.

Trilogy's subsidiary, Trilogy Systems Corp., advanced $5 million to Elxsi for working capital, and Elxsi granted Trilogy an option to acquire 25% of its stock prior to the merger under certain undisclosed circumstances.

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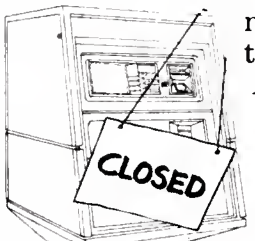
RECOVERY

Ohio bank crisis prompts first-time shutdown of ATMs

By John Desmond
and Clinton Wilder
CW Staff

CINCINNATI — When 71 savings and loan institutions in Ohio closed March 15, the terrific went out of Tellerific; the green went out of the Green Machine; and customers probably called Jeanie something other than her given name.

These 24-hour automatic teller machine networks with the amusing monikers had to stop conducting transactions for customers of the state-insured thrift institutions that were ordered closed after the March 9 failure of Home State Savings Bank of Cincinnati.



The DP manager overseeing Jeanie said the shutdown was a first for his network. However, DP managers serving many of the closed banks reported the shutdown had a minimal impact on their work.

James Hudepohl, vice-president of communications at Cincinnati's Fifth Third Bank, which operates the Jeanie network of 280 ATMs, said the technique used to shut off the eight ATMs in the network affected by the closings had never before been used and would only otherwise be used in disaster recovery. During normal maintenance the machines are never turned off, he said.

An all-IBM shop, the Fifth Third Bank operates multiple 3033 mainframes running MVS/SP 1.3 and more than 100 3380 disk drive spindles. The bank functions as a switch for five ATM networks in Ohio, routing ATM transaction messages to their destinations.

"We keep track of settlements between banks — who owes whom money. The client banks authorize or originate the transactions," said George Landry, senior vice-president of operations and DP at Fifth Third. The bank has 11 million accounts in its data base, but the five closed savings and loans served by Fifth Third were a small percentage of the 86 banks served by the Jeanie network.

To turn the ATMs off, a simple software change was made. "We turn a bit in a table entry that says the machines are not available," Hudepohl said. When customers tried to use a 24-hour access card, they received the appropriate message.

Gov. Richard Celeste ordered the 71 savings and loans closed on the evening of Thursday, March 14. When Landry and Hudepohl came to work the next day, they called the governor's office to ask about shutting down the necessary ATMs. At about 11 a.m., the governor's attorney called back with instructions that the ATMs be closed. "We wanted to make sure we did the right thing," Landry said. "We did everything we could to protect our customers' interests."

The delay in getting authorization to close the ATMs gave those bank customers with access cards a chance to retrieve some cash from their accounts that Friday morning, Landry acknowledged.

Many of the closed Ohio savings and loans are small- to medium-size financial operations that depend on regional data centers for time-shared DP service. Two such data centers in Ohio reported that the closings had a minimal impact on their overall DP operations.

The thrift crisis meant a 15% to 20% reduction in the number of transactions, which averages 100,000 daily, serviced at the NCR Corp. Data Service Center in Dayton, Ohio, according to David Bogner, production manager at the center. Bogner based the estimate on transactions from 15 client savings and loans that had to close. "It meant that I didn't have to print as many reports, but the machines were still busy," Bogner said of the closings.

The all-NCR center operates three mainframe-based systems, each with an NCR Criterion 8575 mainframe with 3M bytes of main memory and the company's VRX operating system. Two systems are serviced by 10 NCR 658 disk drives with a 200M-byte capacity, and one is served by 12 658s. The transaction slowdown had no impact on his staff, and no special preparations were required to service transactions once the client institutions began reopening, Bogner said.

One manager at a Cincinnati-based data center said there may be a secondary DP impact as larger, federally insured savings and loans seek to acquire some of the 71 closed institutions. "Our members are already buying up the institutions that don't want to go back in business under the same name," said Don Cox, manager of data and communications at Savings & Loan Data Corp. (SLDC), which processes transactions for 300 savings and loans institutions in 11 states. "We'll have to convert those accounts. Of the 2,000 accounts that we service [from nine closed savings and loans], I wonder how many will stay in existence."

Cox said that the closings affected less than 1% of SLDC's 250,000 daily transactions. SLDC services its 4½-million-account database with two Burroughs Corp. 4900 mainframes for on-line processing and a third 4900 CPU for systems development and programming.

"These were really mom-and-pop-type operations, so there was not much impact on our processing," Cox said. "We simply stopped handling their transactions. Our problems here were miniscule compared to the people trying to get their money out."

IBM

from page 1

IBM said the fault-tolerant systems, in which a duplicated component takes over for a component that fails, can communicate with other IBM systems, including the IBM 370 environment. Like the Stratus/32, the System/88 reportedly can be arranged in a string of 32 modules.

IBM reported that the System/88 can operate as an independent computer or communicate with other systems through SNA networks and X.25 packet switching networks as well as via bisynchronous or asynchronous protocols.

The System/88 will be available "on a limited basis" in late 1985, according to IBM. The company said marketing support will be provided by a new System/88 office in IBM's National Accounts and National Marketing divisions.

Omri Serlin, head of ITOM International in Los Altos, Calif., and an observer of the fault-tolerant market, speculated that while customers may initially use Stratus application software on the System/88, IBM's move into the field will fuel application production by independent software developers.

He noted that some software that is likely to be used by early customers includes Stratus' interface for IBM's Systems Network Architecture, USF Unix-compatible interface, and Stratus' transaction processing and office systems.

However, he said that the "limited" availability caveat could mean that IBM plans to introduce supplemental products, such as its own interfaces with other IBM systems, in the coming months.

IBM's approval

Serlin said the IBM announcement could have the effect of placing the computer industry giant's stamp of approval on a fault-tolerant market where only Stratus and Tandem have delivered significant numbers of systems. Stratus' installed base of 300 processors runs a distant second to Tandem's more than 7,000 processors.

"The potential for the fault-tolerant market is large already. The principal reason the systems aren't selling is the lack of compatibility with existing equipment and the lack of credibility of some of the companies. IBM's entry could have a blessing effect," noted Serlin.

But he said the entry could also hurt Tandem as IBM gives more credibility to Stratus. "A key influence will be negative in relation to Tandem. Customers who may have liked Stratus' products in the past often decided to go to Tandem because Stratus is new and inexperienced," observed Serlin.

He added that Stratus' OEM agreement with IBM doesn't mean that Stratus will abandon its end-user sales avenues. "They don't want to be captive to IBM," said Serlin, noting that other manufacturers have suffered when they relied heavily on IBM and then watched IBM abandon their product or introduce its own products in competition with the OEM's equipment.

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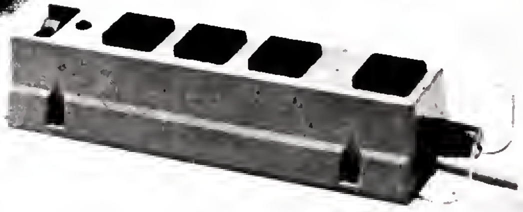

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Burroughs unveils replacements to B4000 series CPUs

By Donna Raimondi
CW Staff

DETROIT — Burroughs Corp. last week launched a line of processors it claims will eventually replace its B2000, B3000 and B4000 series. The firm announced two models of the V series, the V 340 and V 380, said to be direct replacements to the older B4925 and B4955 processors, respectively.

The basic difference between the V 340 and V 380 is their I/O capability. The V 340 has one I/O subsystem, and the V 380 has two I/O subsystems, a company spokesman noted.

Scheduled for delivery beginning in the fourth quarter of 1985, the newly announced machines feature a different instruction set and operating system than the B4000 series machines they replace. The instruction set, said to be 35% larger than the one used on the B4000, reportedly improves the V series processors' ability to function in heavy batch and high-volume transaction processing environments. Burroughs contended that 40% to 50% of its B4000 series customers are from the financial community and are heavy batch and transaction processing users.

The newly announced operating system, MCP 1.0, is a superset of the operating system used on the B4000 line. It adds the ability to support multiprogramming environments, dynamically allocate memory and automatically perform system logging and reporting functions. The operating system can also support shared system configurations, the vendor said. Other capabilities are as follows:

- An on-line, interactive debugging facility at both the program and MCP levels.
- The ability to tailor I/O operations to suit specific devices.
- Multithreading and reentry of operating system functions.

MCP 1.0 is said to be code compatible with its predecesssor so that no changes need to be made to a user's software.

The V 340 and V 380 models include 256K-bit memory chips and are configured with 10M bytes of memory, expandable to 20M bytes in 5M-byte increments. The previous maximum main memory on the B4000 series was 5M bytes, the vendor said. When upgrading memory capacity, memory interleaving is converted from two to four paths, providing additional system throughput and capability, the vendor said.

The character-oriented CPUs use decimal arithmetic and are said to be suited for executing business programming languages such as Cobol, RPG and Linc. The V 340 and V 380 systems contain function processors that operate individually in a pipeline fashion. This allows steps to be overlapped, the vendor said. These steps include instruction prefetch, program and address calculations, data fetch and manipulation, instruction executions and independent I/O initiation and transfer.

Multiterminal environments can be configured on the V 300s with the use of the Burroughs B974 and CP 3680 front-end processors.

The V 340 is priced at $390,400, and the V 380 costs $702,600. More information can be obtained from Burroughs, One Burroughs Place, Detroit, Mich. 48232.

CPU from page 1

B300 and B4000 series processors.

With first deliveries scheduled for the third quarter of this year until the second quarter of 1986, the A 15 was designed to supersede the B7900 processor line. Burroughs still plans to manufacture the B7900, and the units will remain the logical growth path for users of the mid-range A 9 processor line. Hollis L. Caswell, Burroughs' corporate vice-president and president of its System Products Group, said the A 15 was not intended to replace the B7900 line, but he admitted that the performance of the low-end A 15 models overlaps that of the high-end B7900 line. Paul G. Stern, Burroughs' corporate president, said the A 15 line offers a 15% to 20% better price/performance ratio than the B7900 line.

The A 15 models are object code compatible with Burroughs' B5000, B6000, B7000 and A series processors. The A 15 architecture reportedly allows users to run applications software programs from earlier Burroughs systems without having to make a software conversion.

Based on emitter-coupled logic air-cooled gate arrays, the A 15 reportedly requires 55% less power and air-conditioning than a similarly configured B7900.

Eight models of the A 15 line were announced and include the uniprocessor Model F, the dual-processor Models H, I and J; the triprocessor Models K and L; and the quadprocessor Models M and N. The A 15 models are field upgradable within the line, but older Burroughs systems, such as the B7900 line, are not field upgradable to the A 15 line, Burroughs said.

The A 15 Model F supports from 24M to 48M bytes of main memory, whereas the dual-processor configurations support 24M to 96M bytes of main memory. The triprocessor and quadprocessor configurations support from 24M to 192M bytes of main memory, the company said.

The uniprocessor A 15 Model F is said to offer roughly 2.6 times the performance of a comparable uniprocessor configuration of the B7900. Caswell said actual performance of the system ranges from roughly 2.2 times that of the B7900 in Fortran-based scientific applications to 3.5 times that of the B7900 in I/O-intensive data base applications. This difference, Caswell explained, results from architectural improvements in the I/O processing capabilities of the A 15 processors. Caswell said that in a CPU-to-CPU comparison, the A 15 offers roughly twice the performance of the B7900.

The dual-processor versions of the A 15 offer 1.9 times the performance of the Model F, and the triprocessor configurations offer roughly 2.8 times the performance of the Model F. The quadprocessor models offer 3.6 times the performance of the Model F, Caswell said.

The Model F, with 24M bytes of main memory and one I/O subsystem capable of supporting up to 32 data link processors and up to 256 communications lines, costs $2.9 million. It reportedly will be available in the third quarter of this year.

The A 15 Model H, with 24M bytes of main memory and one I/O processor, costs $4.2 million. The Model I, which offers the same main memory as the Model H but with two I/O processors (offering support for up to 64 data link processors and 512 communications lines), costs $4.5 million. The Model J, which offers 36M bytes of main memory, two I/O subsystems and a CPU partitioning option, costs $5.1 million. The dual-processor models reportedly will be available in the fourth quarter.

The Model K, with 24M bytes of main memory and two I/O subsystems, costs $6.1 million. The Model L, with 36M bytes of main memory, two I/O subsystems and a partitioning option costs $6.8 million. The triprocessors will be available in the first quarter of 1986, the vendor said.

The quadprocessor Model M, with 24M bytes of main memory and two I/O subsystems, costs $7.6 million. The Model N, with 36M bytes of main memory, two I/O subsystems and the partitioning option, costs $8.4 million. The quadprocessor models will be available in the second quarter of 1986, the vendor said.

Burroughs is located at One Burroughs Place, Detroit, Mich. 46232.

BURROUGHS CORP.

System	B7900F	B7900H	B7900K	A 15 Model F	A 15 Model I	A 15 Model L	A 15 Model N
Relative Performance[1]	279	474	1,185	725	1,378	1,957	2,537
Mips[2]	6.6	11.2	28	17.1	32.4	46.2	59.5
Memory size in bytes (Minimum-Maximum)	12M-96M	12M-96M	12M-96M	24M-48M	24M-96M	24M-192M	24M-192M
Purchase Price[3] (Memory Size)	$2,000,000 (12M)	$3,000,000 (12M)	$4,000,000 (12M)	$2,920,000 (24M)	$4,530,000 (24M)	$6,790,000 (36M)	$8,435,000 (36M)
Lease Price (Lease Term)	$77,705 (3 Year)	$114,703 (3 Year)	$153,173 (3 Year)	$124,100 (3 Year)	$193,305 (3 Year)	$289,320 (3 Year)	$359,540 (3 Year)
Machine Cycle Time (Nsec)	125	125	125	67	67	67	67
Channels[4] (Minimum-Maximum)	27-256	27-256	27-256	Up to 32	32-64	32-64	32-64
Cache (Buffer) size	144K	144K	144K	Not Available	Not Available	Not Available	Not Available
Bus Architecture?	No	No	No	No	No	No	No
Price per 1M byte of main memory	$25,000	$25,000	$25,000	$12,000	$12,000	$12,000	$12,000

1. CW estimates based on vendor-supplied information. Relative performance ratings are based on an IBM 370/158-3 equaling 45. These numbers are designed to put the processor into perspective with other systems; they do not constitute a buyer's guide. All systems are not alike; they use different operating systems, instruction sets and architectures and, therefore, cannot be directly compared. In addition, actual relative performance may vary with the application, peripherals and software.
2. CW estimates.
3. For the processor, console, power supply and all prerequisites.
4. Burroughs processors use data link processors in place of conventional I/O channels.

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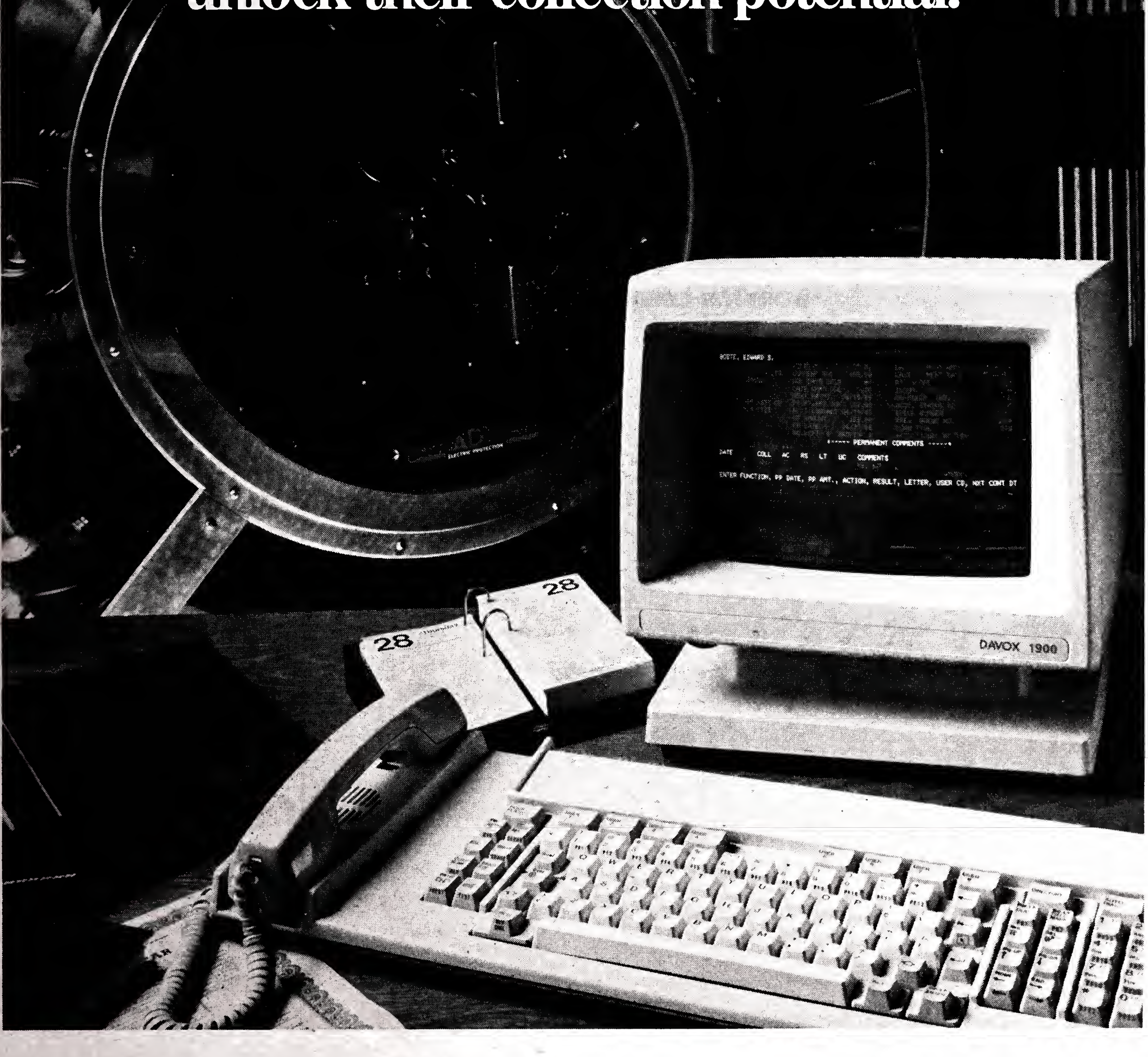

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Honeywell, Burroughs aim to secure mainframe base

By Tom Henkel
CW Staff

Last week's high-end mainframe announcements from Honeywell, Inc. and Burroughs Corp. are attempts to keep IBM from pirating their most treasured mainframe customers, industry analysts observed.

The Honeywell DPS 90 and Burroughs A 15 lines are part of a traditional game played by members of the so-called Bunch mainframe vendors, noted Harry Edelson, president of Edelson Technology Partners, a consulting firm based in Saddle Brook, N.J.

Edelson explained that vendors competing with IBM must quickly demonstrate that they can match the performance of IBM's latest high-end processors or run the risk of losing their high-end mainframe customers to IBM. He said it would have been more surprising if Honeywell and Burroughs had failed to announce products that compete with IBM's 3090 line.

According to Edelson, the user base of the Bunch companies has slowly eroded during the past 10 years, with most of those users switching to IBM or compatible systems. Edelson said he expected that the latest round of processors from Burroughs and Honeywell would curb the loss of customers to IBM but probably would not stop the trend.

Frank Gens, an analyst with the Boston-based Yankee Group consulting firm, said that keeping up with IBM on the hardware front is only one part of the equation. The Bunch companies are comparatively weak in matching IBM's impressive list of mainframe software, he said.

Similar but different strategies

The latest announcements from Burroughs and Honeywell are striking similar but reflect the companies' markedly different business strategies.

Both vendors announced processor lines of one-, two-, three- and four-CPU configurations. Burroughs has offered several additional models with varying main memory and I/O processing capabilities, and Honeywell added the DPS 90/92T, a redundant configuration, to its line.

Both the A 15 and DPS 90 lines appear to offer internal performance that competes favorably with IBM's performance claims for the 3090 systems. However, both companies chose to match but not really exceed the performance of IBM's 3090s. Many industry watchers have long held as a commandment for successfully competing with IBM that one should never tip one's hand in anticipation of future IBM announcements. Honeywell and Burroughs appear to have obeyed that commandment.

Honeywell and Burroughs have targeted the same basic delivery window — late 1985/early 1986 — for their high-end systems. This move appears to have been geared to the general expectation that IBM's high-end 3090 Model 400 would be available much earlier than the 1987 delivery date IBM finally announced.

Although most aspects of IBM's 3090 announcement were fairly predictable, the 1987 availability of the Model 400 was a surprise, Gens noted. He speculated that Honeywell and Burroughs, like Hitachi Ltd., which had announced its version of the 3090s two weeks earlier [CW, March 18], accurately anticipated the performance IBM's Sierra line would offer but geared their development efforts to coincide with an expected late 1985 availability of the Model 400. Now all three firms appear to be hoping to cash in on the long wait for the Model 400, he said.

IBM delay for financial reasons

Gens noted that IBM appears to have delayed delivery of the Model 400 for purely financial purposes — namely, to sell more 3080 series processors — as opposed to technical difficulties.

A notable difference between the Burroughs and Honeywell announcements is that Burroughs has developed and will manufacture the A 15 CPUs, as well as disk drives through its Memorex Corp. subsidiary, whereas Honeywell plans to integrate Japan-based NEC Corp.'s S-1000 CPU with IBM's 3380 disk drives to form the DPS 90.

A Honeywell spokeswoman emphasized that although Honeywell has designed its system around the S-1000, the two systems are not interchangeable. The DPS 90 contains modifications that make the device compatible with Honeywell's Gcos 8 systems software environment. Likewise, whereas Honeywell buys 3380s from IBM and tape drives from Storage Technology Corp., the subsystems formed from the peripherals are tailored to the Honeywell environment.

With the Burroughs and Honeywell announcements, three of the five Bunch companies have announced systems that compete with IBM's high-end processors (Control Data Corp. enhanced its Cyber 180 line before IBM unveiled the 3090). NCR Corp. and Sperry Corp. have yet to respond with products to IBM's announcement.

Gens noted that NCR, which has traditionally appealed to a lower level user, may not immediately unveil a 3090-class processor. Thus, the spotlight now will be on Sperry.

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Private-line rate changes to pose challenge for users

By Bryan Wilkins
CW Washington Bureau

WASHINGTON, D.C. — Barring any further changes, private-line users face an uphill climb understanding and converting to AT&T Communications' revised private-line rates, slated to go into effect April 6.

The rate changes will have the greatest "adverse" impact on multipoint private-line customers, according to William Fanslow, an AT&T account manager who made his remarks in the first video teleconference held by the International Communications Association (ICA), a telecommunications managers' group. Multipoint lines are being hit so hard because the per-station installation fee for voice-grade, private-line service is scheduled to skyrocket from $78 to $374, Fanslow said. Other increases will be reflected in the new tariff structure, which breaks down private-line rates into interexchange and local components. In aggregate, the totals of the rate components are more than current costs for end-to-end, private-line service, Fanslow said.

The interexchange rates reflect the higher special-access rates the former Bell operating companies are charging AT&T to terminate private-line facilities. Previously, AT&T Communications' private-line tariffs bundled the local-exchange portion of the transmission together with the interexchange charges.

Fanslow said that the three categories of service — total, coordinated and baseline — will each have advantages and disadvantages.

- Total service will put complete end-to-end responsibility into the hands of AT&T Communications.
- Coordinated service will mean the customer gets two bills — one from AT&T and one from the local-exchange carrier for access. AT&T will act as an agent of the customer in procuring the local loops.
- Baseline service leaves the service configurations and local-exchange access up to the customer. AT&T will not guarantee end-to-end service as it will in other categories.

Planning by telecommunications managers will become especially important since the different private-line access options will range in cost from $45 to $115 per month, depending on type of service and distance, Fanslow predicted.

On the other hand, Lee Selwyn, president of Economic Technologies, Inc., sees the "unbundling of local access as providing lower cost opportunities for the customer."

Under the new tariff structure, rates for local-access facilities will be distance-sensitive like AT&T Communications' traditional interexchange services. Other private-line options requested by the customer to be performed by the carrier — such as common control switching arrangements, bridging, multiplexing, customer-controlled reconfigurations and teleconferencing arrangements — will also trigger separate charges.

Users will still be able to receive other private-line service features like signaling, conditioning, echo suppression and analog-to-digital conversion at additional cost.

ICA counsel Brian Moir told the video teleconference audience that ICA is encouraging the Federal Communications Commission to structure the tariffs so that local third-party suppliers other than AT&T and the former Bell operating companies can provide connection services between customers and AT&T central offices. These suppliers would have the advantage of offering nontariffed services.

AT&T will accommodate these third-party suppliers, Fanslow said, but presently cannot process their requests for service hookups. He said AT&T Communications does not plan to accommodate CATV companies as carriers. Another impact on users is a projected increase, up to an additional $11 a month, in the current $25 per month surcharge on private branch exchange stations serving private-line configurations, Fanslow said.

Software tax issue raised

Prompted by lawsuits, officials examine ruling

By Maura McEnaney
CW Staff

OLYMPIA, Wash. — Officials for the state of Washington's Department of Revenue here are examining its 1982 ruling that exempted software licenses from state sales taxes.

The examination was prompted by several suits brought against the Revenue Department by companies seeking to recoup approximately $1 million in back taxes paid on software licenses during a four-year period. The state has agreed to grant the refunds, following an audit by the department.

According to Washington attorney Sam Saracino, the Revenue Department exempted software licenses from the sales tax in response to a request from IBM. The ruling said that although off-the-shelf software was tangible property and subject to the state's 7.9% sales tax, software employing "nonexclusive license-to-use" arrangements did not constitute retail sales and was not subject to a sales tax.

As a result of the ruling, Seattle-First National Bank filed suit against the state, seeking $750,000 in taxes it claims to have paid on software agreements. Saracino represents Seattle-First in the case.

Boeing Computer Services Co. in Richland, Wash. and Rainier National Bank in Seattle have also filed suit against the state. The suits are subject to the state's four-year statute of limitations.

State officials have examined the licensing arrangements at Rainier, but the bank has received no refund, according to Murray Aston, vice-president and corporate tax manager. Rainier is seeking approximately $70,000 in back taxes paid on software licenses.

Although few companies have filed suit against the state, "The potential revenue loss is significant," Johnson said. "It's a multimillion dollar matter." The Revenue Department ruling not only changed the software licensing agreements but also the way that software companies in the state are taxed.

Currently, the state's gross-receipts tax consists of two rate structures: Retailers and wholesalers are charged approximately 0.5%, and service organizations, such as banks, pay a 1.5% gross-receipts tax. By ruling that customized software is not subject to retail sales tax, the Revenue Department classified software companies in Washington as service businesses, subjecting them to three times the tax payments.

The Revenue Department's findings on the software tax policy are expected to be released in approximately one month, according to Lee Johnson, state assistant attorney general.

Meanwhile, the tax ruling continues to hold widespread implications for Washington businesses, Saracino said. Companies that paid 7% tax on a $100,000 annual software license could recoup approximately $25,000 paid over a four-year period, he said. However, when he explained the implications to the Washington Bankers Association, "A lot of people just weren't interested in pursuing it," he said.

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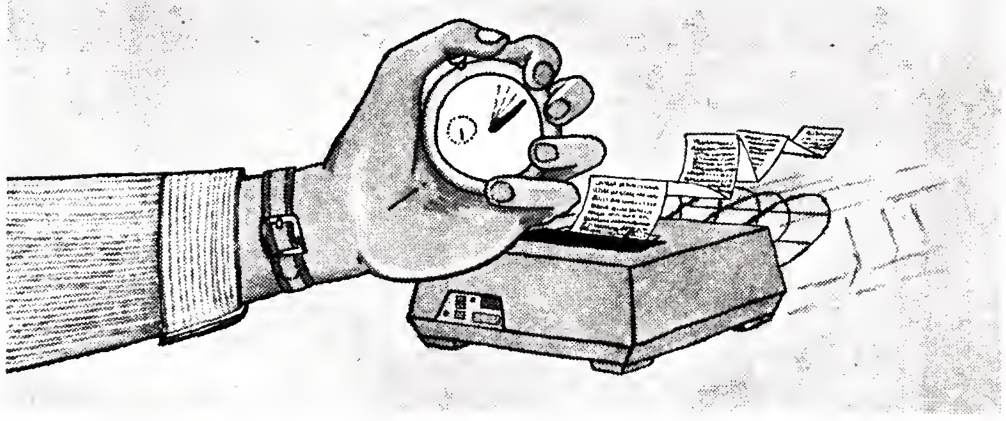

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Compaq unit integrates micro with communications

By Eric Bender
CW Staff

NEW YORK — Compaq Telecommunications Corp. of Dallas, a subsidiary of Compaq Computer Corp. of Houston, last week rolled out a workstation that integrates personal computing and communications tasks.

The Telecompaq reportedly targets managers in medium- to large-size corporations who are not presently computer users and combines an IBM Personal Computer-compatible micro with a host of voice/data communications functions.

The Telecompaq allows users to switch between functions by pressing a single button, the company said. With two telephone lines or future links to digital private branch exchanges [PBX], the Telecompaq handles simultaneous voice and data communications. Users can reportedly suspend a personal computing task to make or receive a call and then resume the personal computing task where they left off.

Six models were introduced, offering a range of random-access memory (RAM) and disk storage options. Top-end models feature 640K bytes of RAM and a 10M-byte hard disk drive.

The Telecompaq is built around an Intel Corp. 8086 processor with 384K bytes of RAM for personal computing and personal productivity work and a Zilog, Inc. Z80A communications processor with 64K bytes of RAM. The dual-speed Intel processor runs at 4.77 MHz and 7.14 MHz.

Other features include an integral 9-in. green text-graphics monitor, an internal Hayes Microcomputer Products, Inc. 300 bit/sec or 1,200 bit/sec modem, two IBM-compatible expansion slots, an RS-232C port, a parallel port, a battery-powered data/clock system, two 360K-byte diskette drives for personal computer applications, a third 360K-byte diskette drive for personal productivity use, an IBM-style keyboard enhanced with function keys and Microsoft Corp.'s MS-DOS 2.11 operating system.

For voice communications, the Telecompaq offers a separate telephone unit with speakerphone and handset and a telephone function panel next to the computer screen.

Built-in support software reportedly provides 80 user-programmable telephone functions; TTY and ADM3A terminal emulation; an electronic phone directory with search capabilities, attachment of notes and addresses and autodialing; a data communications directory for automatic connection, modem setup and dialing, file transfer and capture to and from disk; automatic logon and logoff abilities; and electronic mail.

The bundled productivity software permits users to switch between computing and communications tasks and also gives calendar, electronic notepad and calculator applications. Dedicating a third drive to these tasks permits managers to create their own portable data bases on diskette, Compaq Computer President Rod Canion pointed out.

Compaq does not presently plan to offer an upgrade kit for its current personal computer customers.

Three versions that connect to two standard analog telephone lines are scheduled for June shipment, while three other systems that interface to six standard analog keyset lines will be delivered in August, Compaq said.

The Telecompaq is priced from about $4,195 to $6,395, depending on configuration, the vendor said.

Compaq announced a joint marketing and research and development agreement with Mitel, Inc. of Boca Raton, Fla., under which Mitel will remarket the Telecompaq as a peripheral to its SX-2000 digital switch under the name of Superstation by late summer. The two companies also will work together on a proprietary interface to the SX-2000 integrating the Superset 4 electronic telephone with the Superstation.

In addition, Compaq has signed PBX interface licensing agreements with Northern Telecom, Inc. and AT&T Information Systems, according to C. Murray Francois, president of Compaq Telecommunications.

Compaq Telecommunications is headquartered at 15182 Marsh Lane, Dallas, Texas 75244.

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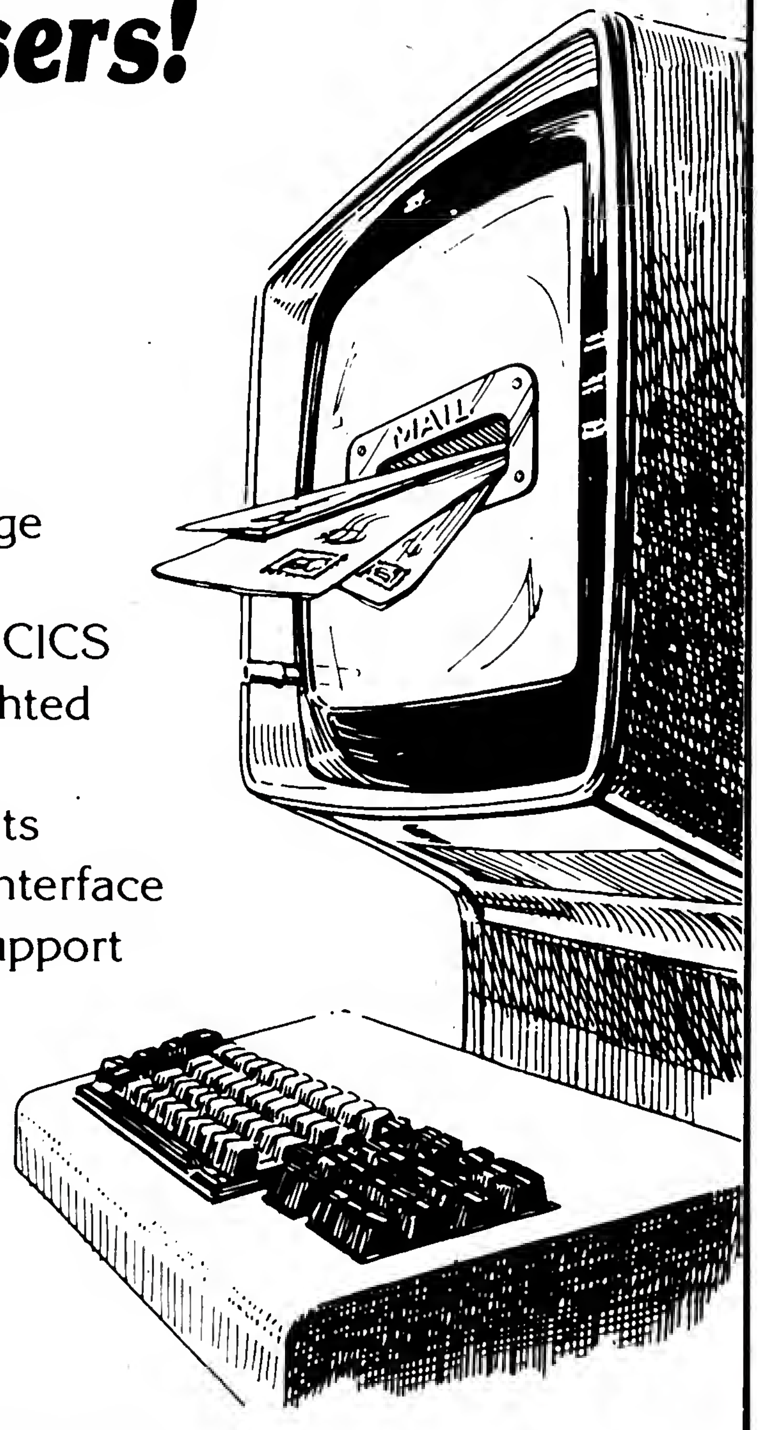


Syracuse, DEC agree to create university net

SYRACUSE, N.Y. — Syracuse University (SU) and Digital Equipment Corp. have signed an agreement to create a computer network that will link the university's 14 schools and colleges and a number of residence halls.

The network will connect computer-aided design laboratories and computers for general-purpose processing, along with clusters of graphics computers. It will also extend to four dormitory sectors of the SU campus and will allow residents access to the systems.

As part of the agreement, SU will acquire $15 million worth of computing and networking resources from DEC.

The purchase includes a cluster of VAX 8600s, DEC's recently announced top-of-the-line superminicomputers.

A DEC spokesman estimated that four to five years will be required to complete the network.

Analysts laud Unix PC interface, decry lack of tools

By Edward Warner
CW Staff

Computer industry observers who have worked with the AT&T Unix PC said the machine's stellar feature is the icon-based interface that it relies on to make the Unix operating system easy to use.

That interface, analyst George Colony noted, while not technically a shell, "is definitely easier to use than MS-DOS" and will be the major reason why "you're going to see a lot of onesies and twosies [of the unit] in [Fortune 1,000-size] companies."

Colony, president of Forrester Research, Inc., in Cambridge, Mass., said he has used the Unix PC for two weeks, and his biggest criticism is its lack of "a set of applications like the MS-DOS library."

Russell Gee, vice-president of Access Technology, Inc., a Natick, Mass., software vendor, said it is too early to tell whether the Unix PC is the "breakaway box" for Unix that the IBM Personal Computer was for DOS but praised the machine as "a serious and well-thought-out next step." Gee, whose firm will soon offer a Unix version of its 20/20 spreadsheet for the machine, said the success of the Unix PC will be determined by third-party software houses that write programs for it.

Concurring with this perspective was Jim Sullivan, senior analyst at Yates Ventures, Inc., a Palo Alto, Calif., market research firm specializing in Unix. Though he said he expects Unix to be received very well by the corporate personal computer market, Sullivan added, "We need to see how well the software industry is going to align itself with the machine and the Unix marketplace."

Benefits needed to justify conversion

The lack of Unix applications software, meanwhile, will prevent at least one corporate microcomputer manager from urging his firm to switch to Unix. The "benefits [of Unix] must be more significant than [those of] MS-DOS to justify going through the agony of conversion [to it]," said Gene Maiman, project manager for microcomputers at Columbia Pictures Industries, Inc. in New York.

The switch from MS-DOS to Unix as the operating system of choice is a virtual certainty, however, according to Lou Dasaro, technical analyst for Complete Technology Corp., an Elmhurst, Ill., firm that provides contracted corporate microcomputer support services. Dasaro predicted that "MS-DOS is going to run as a Unix application, and that's the way thing's are going to go."

Competition for the Unix PC, according to analyst Sullivan, will come from several supermicrocomputers — in particular, the Altos Computer Systems, Inc. Model 586, the Convergent Technologies, Inc. Miniframe and the NCR Corp. Tower — as well as the IBM Personal Computer AT.

Colony, meanwhile, predicted that potential users' unfamiliarity with Unix will limit the new machine's sales largely to engineers and scientists, a group already possessing some Unix experience. Although AT&T has priced the machine at the low end "as a loss leader," Colony said, he did not expect the former telecommunications giant to be able to sell more than 40,000 Unix PCs in the next 12 months.

The fear among software developers that IBM will come to dominate the market for software for its own machine is what software vendor Gee acknowledged as an incentive for developers to write for Unix. "The whole market is scared of IBM becoming the field marshal," he said.

AT&T from page 1

The Unix PC supports up to nine casual users and up to four users in tasks with heavy processing requirements such as word processing, Edwards said.

Telephone features, available by plugging in a standard handset, reportedly include simultaneous voice and data communications, dialing services, a host of call management features and an optional electronic mail capability. An internal 300/1,200 bit/sec modem is standard.

> *'There is very little "value-added" that even AT&T can bring to the marketplace if we do it box by box'*
>
> **—James Edwards**
> **AT&T Information Systems**

A basic Unix PC, priced with operating system at $5,590 and shipping now, includes the CPU with 512K bytes of random-access memory (RAM), expandable to 2M bytes; a 512K-byte diskette drive; a 10M-byte hard disk drive; three expansion slots; a mouse; a keyboard; a 12-in. monochrome monitor with 720- by 348-pixel resolution; a parallel port; an RS-232C port; and a clock calendar.

AT&T announced 28 software packages for the Unix PC, half of which are programming and development tools, and hopes to double that number by midyear, Edwards said.

Upgrades to the 6300 will permit that machine to compete head-to-head with the IBM Personal Computer AT, Edwards said.

Among them, the AT&T Communications Manager expansion card includes a 300/1,200 bit/sec modem and supports simultaneous voice and data transmissions, one-button dialing, context switching between communications and personal computing applications and emulation of AT&T 4410 and Digital Equipment Corp. VT100 terminals. The card, priced at $599, will be available this month.

AT&T also introduced a version of the 6300 with 512K bytes of RAM and a 20M-byte hard disk drive, shipping in second-quarter 1985, which is priced at $5,620.

Xenix 3.0, The Santa Cruz Operation's adaptation of Microsoft Corp.'s Xenix, is available now for the 6300, priced at $395.

Additionally, an Intel Corp. 8087-2 numeric coprocessor will be marketed this month for $295. A $150 mouse also will be available this month.

The Starlan local-area network was described as a 1M bit/sec twisted-pair network designed to connect Microsoft's MS-DOS and Unix machines to each other and to AT&T's Information Systems Network. A typical configuration linking a Unix-based system with an MS-DOS machine would cost about $1,500.

Starlan supports both star and daisy-chain configurations. A reasonable upper limit is reached at about 200 nodes, with additional expansion capabilities under ISN, officials said.

Starlan reportedly is compatible with the IEEE's 802.3 network development effort and with Microsoft Networks software.

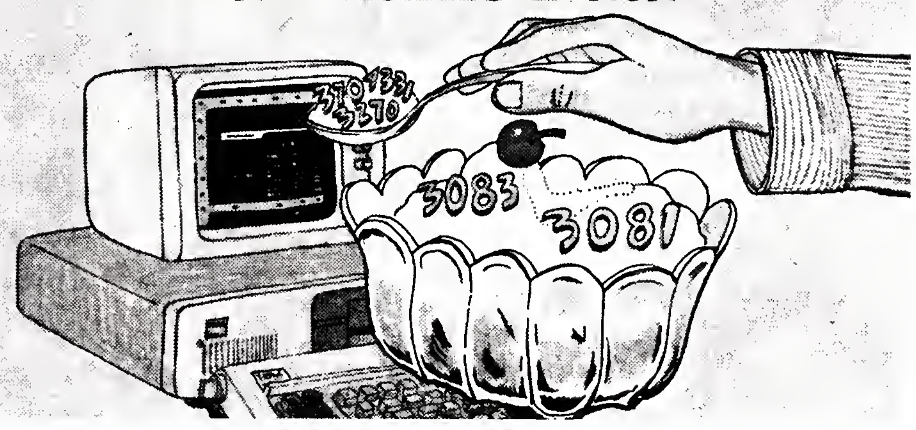
The net will have a phased introduction beginning in fourth-quarter 1986. Full file-sharing between machines running the two operating systems is not scheduled until first-quarter 1986.

The AT&T Personal Terminal, complete with soft-touch screen, reportedly provides managers and executives with one-touch access to voice and data information and all System 75 and 85 PBX Unified Messaging services.

The system will be offered next month for $1,795, or for $1,895 including keyboard. Optional add-on phone directory and security cartridges will be priced at $70 and $50, respectively.

AT&T Information Systems is located at 100 Southgate Pkwy., Morristown, N.J. 07960.

How To Delight Your Lotus With Mainframe Data



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Mainframe package joins Lotus tools, Cullinet software

By John Gallant
CW Staff

BOSTON — Cullinet Software, Inc. and Lotus Development Corp. targeted the corporate information center with the introduction last week of a system that combines Cullinet's Information Database (IDB), end-user-oriented mainframe tools and host data links to Lotus' 1-2-3 and Symphony.

The Information Center Management System (ICMS) is designed for IBM mainframes under IBM's standard operating systems. The software offers end users access to host data from mainframe terminals; so-called departmental machines from manufacturers including Data General Corp., Digital Equipment Corp. and Wang Laboratories, Inc.; and microcomputers running 1-2-3, Symphony, Cullinet's Goldengate integrated software and other micro packages.

A Cullinet spokesman said ICMS is based on three components. The first component was described as an IDB-like facility that provides access to mainframe data maintained in Cullinet's IDMS/R relational data base management system, IBM's Vsam, DL/1, IMS and other systems. Based on Cullinet's IDB technology, the facility allows users to access data in IDMS/R and Vsam files directly and provides a summarization of data maintained in other data bases.

The second component — the End User Computing Facility — includes both end-user data query and application development and report writing tools. The Automatic System Facility and the On-Line Query system contained in the component are both nonprocedural, menu-driven tools. The Automatic System Facility allows end users to develop ad hoc mainframe applications and reports from a terminal. On-Line Query enables users to query mainframe data using relational commands.

The spokesman said the third component of ICMS, known as Open Systems Architecture, provides for the integration of other processors, including departmental machines and micros. Cullinet has already announced interfaces linking its mainframe systems to DEC's All-In-One and DG's CEO office systems and Wang Office software.

In addition, Cullinet's Universal Link and Symphony Link packages will tie Goldengate, 1-2-3 and Symphony into ICMS. Universal Link is designed to provide users of Goldengate and 1-2-3 on the IBM Personal Computer with access to mainframe data within IDB. Symphony Link will deliver the same capabilities to Symphony users.

Both links will automatically reformat mainframe data into the appropriate formats for use within the micro software and will facilitate both data uploading to and downloading from the IDB component of ICMS.

The spokesman said that Lotus worked closely with Cullinet in the development of the link portions. Cullinet will market ICMS as a standalone information center offering that does not require the installation of its IDMS/R.

The mainframe portion of ICMS is currently available and costs $150,000. Both Cullinet's Universal Link and Symphony Link will be available in the fourth quarter. Universal Link will cost $300. Pricing for Symphony Link has not been set, but the spokesman said it will be approximately $300. Pricing for the departmental machine interfaces will be set by DEC, Wang and DG.

Cullinet Software is located at 400 Blue Hill Drive, Westwood, Mass. 02090.

Report to target DBMS issues

The increased use of multiple data bases and moves by vendors toward integrating applications more tightly around a central data base management system are two of the factors that give DP managers something to think about when considering the DBMS issue.

The June *Computerworld* Special Report will focus on DBMS and the continuing evolution of that market. The report will also cover issues of purchasing and maintaining the corporate data base.

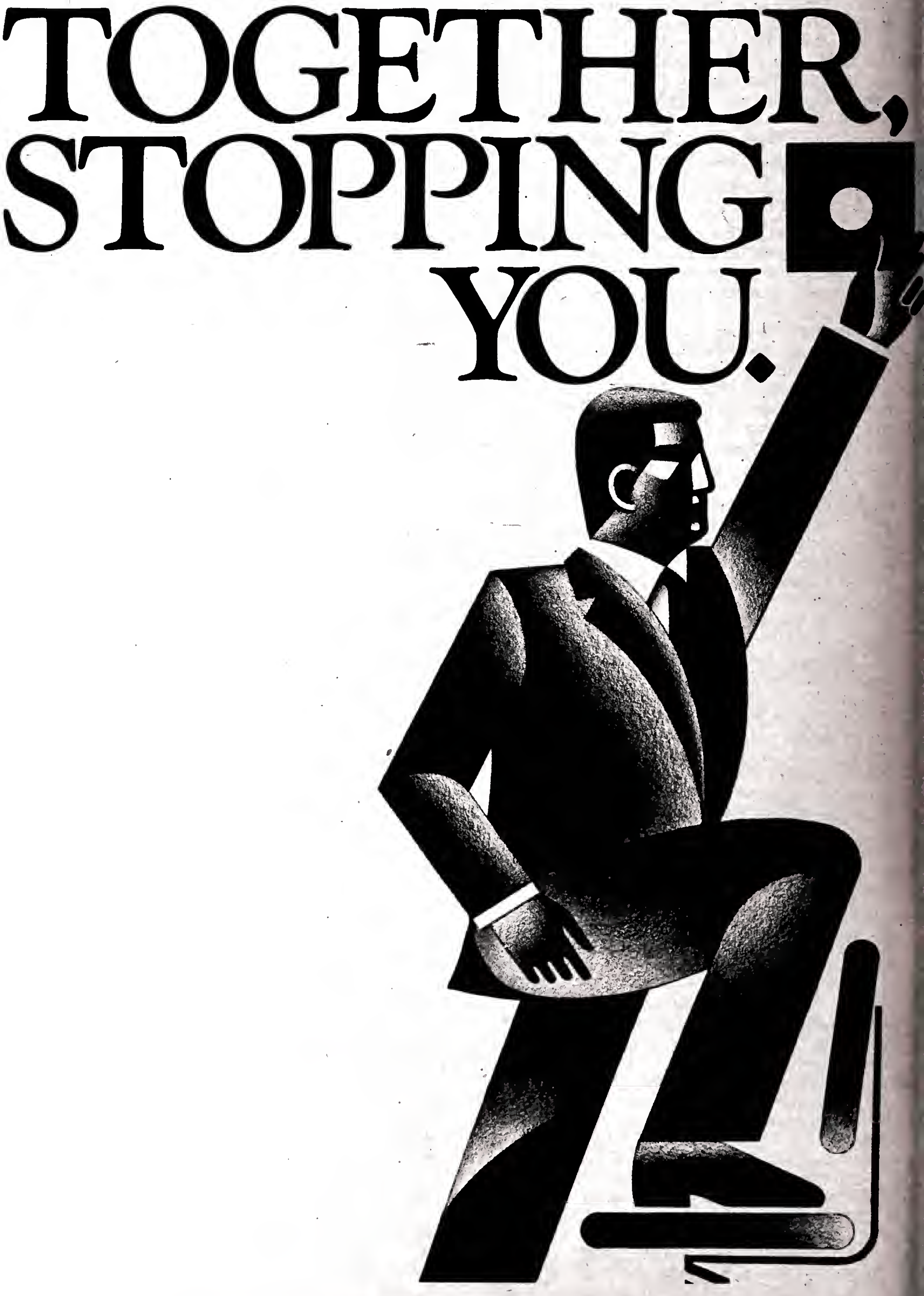
Contributions to the Special Report are welcome and should take one of two forms: a tutorial article, discussing an issue or trend, or an application story, outlining a particular user firm's experience with a data base management system.

Articles must be typed, double-spaced and range in length from four to six pages. Artwork, such as charts, graphs and photographs, is welcome.

Authors should include a brief biography and a telephone number at which they can be reached.

The deadline for submissions to the Special Report is May 5.

If you have a story you would like to tell or any questions to ask, send them to Janet Fiderio, Special Reports Editor, *Computerworld*, Box 880, 375 Cochituate Road, Framingham, Mass. 01701.



Justice monitoring bias in airline reservation systems

By Mitch Betts
CW Washington Bureau

WASHINGTON, D.C. — The U.S. Department of Justice is monitoring a new form of bias in airline computerized reservation systems (CRS) and may have to seek divestiture of the highly successful systems if they are found to be monopolistic, an official told Congress recently.

The issue was explored at a recent hearing held by the U.S. Senate Subcommittee on Aviation, which is searching for remedies to the admitted bias in the reservation systems owned by United Airlines, Inc. and American Airlines, Inc., the dominant air carriers in the U.S.

The Civil Aeronautics Board (CAB), before its demise last year, issued rules prohibiting an airline-owned CRS from favoring the airline's own flight schedules in the "primary display" [CW, Aug. 6]. But at the subcommittee hearing, a Justice Department official said the airlines are providing travel agents with an automatic bypass feature that shows them a second display, which is intentionally biased in favor of the CRS owner.

'Result of loophole'

Charles F. Rule, deputy assistant attorney general for antitrust, said the airlines have taken advantage of a loophole in the CAB rules, which are now administered by the U.S. Department of Transportation. "The secondary screen phenomenon is a result of that loophole," Rule testified.

In addition to the secondary display bias, Rule said, the Justice Department is concerned about recent increases in the fees that American and United charge smaller airlines to be listed in the reservation systems. The high charges "may reflect monopoly prices," he testified.

"All options, including litigation and divestiture, are being held open," Rule said, adding that further regulation by the Department of Transportation would be preferable to divestiture.

Matthew Scocozza, the transportation department's policy chief, said that the CAB apparently believed that if travel agents had equal access to biased and unbiased displays, agents would opt for the unbiased one.

"It is now claimed that the continued availability of biased displays, coupled with mechanisms and [financial] incentives that make it less attractive to use primary displays, threaten to undercut the rules against bias," he testified.

Rule and Scocozza, however, said the government should not rush into further regulatory action but should monitor the situation for several more months and see how the CAB rule works.

But smaller airlines urged the government to take much quicker action to stop what they view as monopoly activity.

'Purpose of deregulation threatened'

Daniel May, president of Republic Airlines, Inc. of Minneapolis, testified: "In the CRS situation . . . market forces are not working, and the basic purpose of [airline] deregulation is threatened."

> *'All options, including litigation and divestiture, are being held open.'*
>
> **— Charles F. Rule**
> **U.S. deputy assistant attorney general**

He said that the remedy is to prohibit airlines from owning CRS systems. "This can be accomplished either by sale or spin-off to existing stockholders," he suggested.

Executives from United and American vigorously defended their CRS ventures, arguing that their foresight and hefty financial investments in CRS have resulted in major improvements in service for all airline customers.

They said that the competitive advantage of display bias — or "preferential sequentialization" — was the original incentive for making the investments.

Robert L. Crandall, president of American Airlines, said his firm's Sabre CRS is the largest real-time commercial data processing and communications system in the world and "one of the great success stories of the modern free enterprise world."

'An awe-inspiring achievement'

"The system is capable of processing, at its central site, in excess of 1,000 messages per second, and in data processing terms that is an awe-inspiring achievement," Crandall told the subcommittee.

If he had to sell Sabre, Crandall said, "the purchase price would be large, because it is a profitable business, and it is not a business we [would] choose to get out of."

Crandall testified that he instituted the secondary display feature only because United did, and said he would get rid of it only if his competitors did, too.

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Ordinary software packages can be frustratingly easy to outgrow. Not KnowledgeMan. Each KnowledgeMan component has more power than you'll probably ever need—far more than conventional integrated programs. With KnowledgeMan, you don't sacrifice capability, capacity or convenience. So with KnowledgeMan, you spend your time solving problems—not trying to overcome software limitations.

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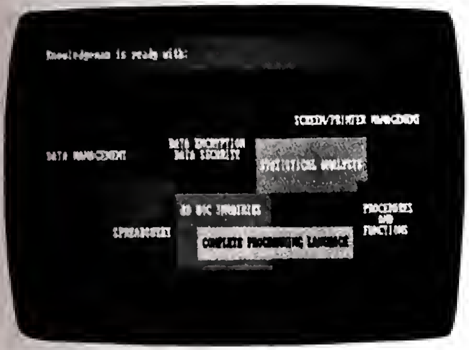
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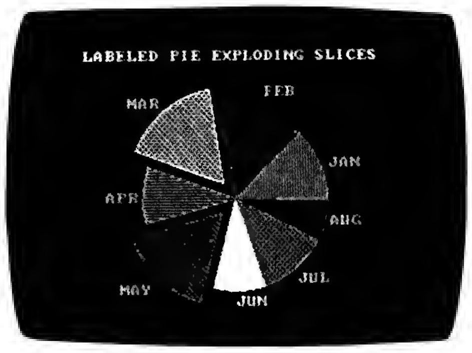


WASHINGTON UPDATE
Mitch Betts
CW Washington Correspondent

Grace Commission's proposals get GAO nod

WASHINGTON, D.C. — The General Accounting Office (GAO) recently reported that it agrees with most of the cost-cutting recommendations of the so-called Grace Commission in the area of government computer operations.

The president's Private Sector Survey on Cost Control, chaired by industrialist J. Peter Grace, reported in January 1984 that the government has not effectively managed its information systems, resulting in obsolete and inefficient DP operations.

The GAO, in a report to the U.S. Congress, agreed with the Grace Commission about the need for improved management, leadership and technical support for government DP operations. For example, the GAO supported the consolidation of duplicate payroll systems and improvements in the procurement process.

GAO tells agencies to cut leasing costs

WASHINGTON, D.C. — U.S. government agencies, which spend about $1.1 billion a year to lease computer hardware, could reduce costs on existing leases by refinancing the leases or buying the installed equipment, the General Accounting Office (GAO) reported.

A recent GAO report said the auditors had studied leases covering 240 hardware items and found that leasing alternatives would have produced savings of 25% to 70%.

The leasing alternatives, the GAO said, include the following:

- Purchasing hardware that an agency plans to keep for a long time.
- Refinancing a straight lease to reduce leasing costs, by means as a sell/lease back transaction, or replacing hardware with identical equipment leased from the used computer market.
- Exercising contractual options to change from a lease to an installment purchase.
- Replacing leased equipment with government-owned equipment no longer needed by another agency.

"DP managers at the civilian and defense installations GAO visited had not identified or pursued the various refinancing alternatives open to them," the GAO reported.

The GAO urged the heads of federal agencies to require DP managers to conduct a cost-effectiveness analysis of all existing leases and develop a plan to employ the refinancing options described in the report.

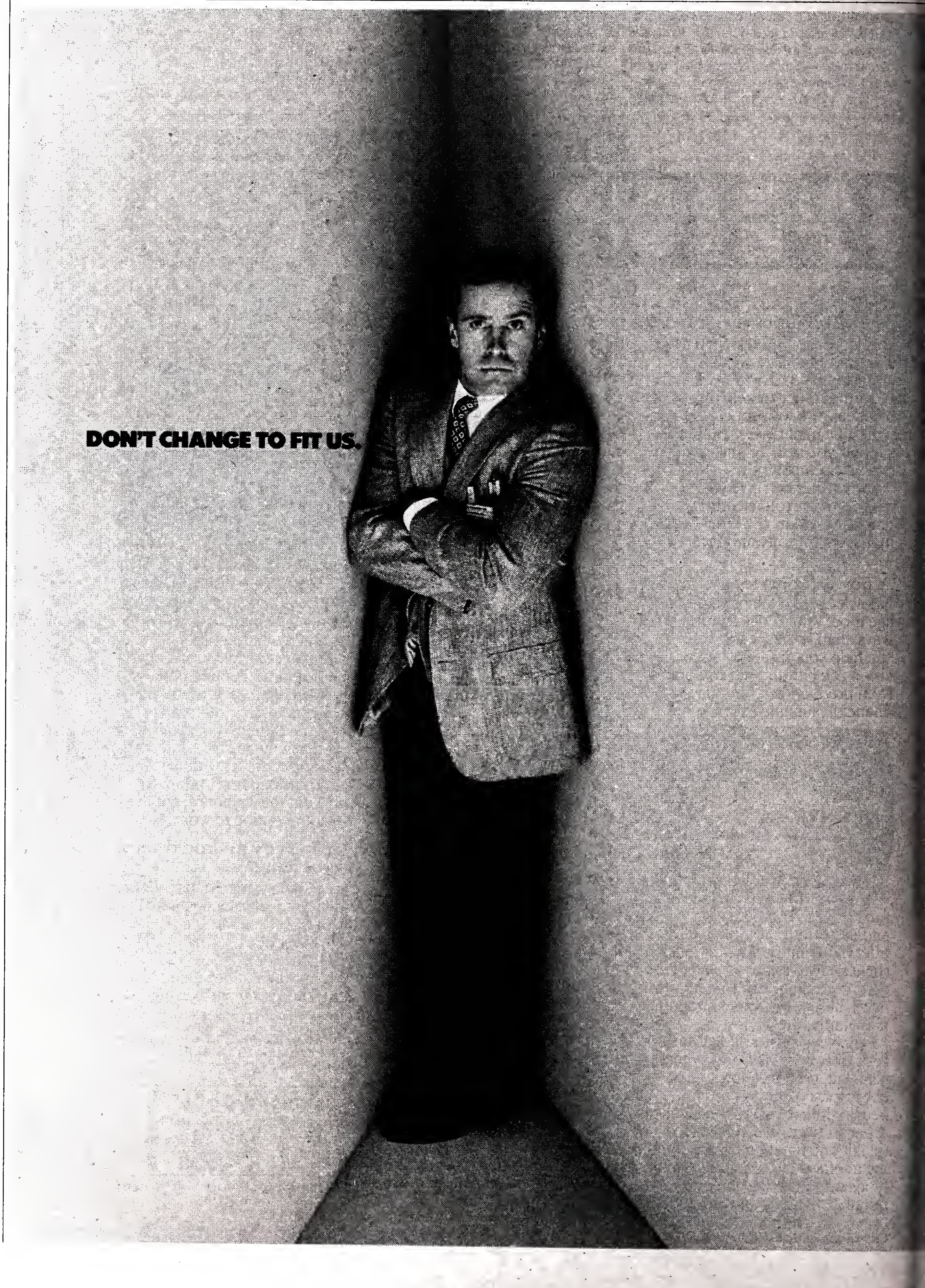
Congressman skeptical of FBI data base plan

WASHINGTON, D.C. — Rep. Don Edwards (D-Calif.) recently expressed strong reservations about a Federal Bureau of Investigation plan to expand its national crime data base to include an intelligence file of reports about suspects in white-collar crimes.

The FBI plans to expand the National Crime Information Center to allow federal, state and local law enforcement agencies to enter information about persons being investigated for serious white-collar crimes. Information in the proposed Economic Crime Index could include unverified reports and police speculation about persons who have not been charged with a crime.

Edwards, who is chairman of the U.S. House Subcommittee on Civil and Constitutional Rights, recently wrote to the U.S. Department of Justice expressing concern that the expanded data base would include investigational data that is not in public records. He said it may be inaccurate and would be widely available to law enforcement officers around the country. The FBI data base plan was also questioned by the American Civil Liberties Union.

"Certainly, we must fight crime at all levels in our society," Edwards wrote. "But we also have an obligation to preserve our fundamental constitutional liberties, including the right to privacy and the presumption of innocence."


DON'T CHANGE TO FIT US.

Optometrists write prescription for VDT eyestrain

By Mitch Betts
CW Washington Bureau

WASHINGTON, D.C. — Concerned about VDT workers' frequent complaints of eyestrain, leading optometrists urged office managers to reduce sharply office lighting levels in an effort to cut glare. They also suggested that managers encourage rest breaks and job variety and purchase VDTs with stable, legible screen characters.

The recommendations were made at the American Optometric Association's Symposium on Vision in the High-Tech Society, held here recently. One presentation, by Hicksville, N.Y., optometrist Lowell Glatt, recommended the use of lightly tinted polarizing glasses that, he said, reduce glare and improve eye comfort for VDT workers.

The optometrists said VDT workers should receive regular eye examinations because VDT work can aggravate existing vision problems, even minor ones that do not affect such tasks as reading or driving, and because people who wear glasses or contact lenses may need a special prescription for focusing on the intermediate distance of the VDT screen.

Bifocals require trifocals

Glatt said that bifocal wearers, who must tilt their heads back to focus on the VDT, should use wideband trifocal lenses for VDT work, with the middle band of the lens focused on the VDT screen.

He also urged corporate managers to hire VDT workers based on their visual abilities. "If you needed a typist who could type at 100 words per minute, you wouldn't hire someone who could type at 50 words [per minute]," he observed, "so why should you hire someone who doesn't have the visual skills to do the job?"

Vincent King of the Ferris State College of Optometry in Big Rapids, Mich., said dozens of private and government VDT studies have shown that people who work on VDTs for hours on end are the ones most likely to suffer eyestrain.

He recommended rest breaks and redesign of the job so that workers can use their eyes in different ways throughout the day. "It is the continual focusing on one task that puts stress on the eyes," he said.

Glare biggest gripe

The top-ranked complaint among VDT workers is lighting glare from windows and overhead lighting, King said. On that subject, Donald Pitts of the University of Houston College of Optometry, made several recommendations for office managers:

■ Cover windows with blinds, awnings, curtains or reflective film.

■ Use indirect lighting, install diffusers over fluorescent lights and use dimmer switches.

■ Cover walls with low-reflectance materials in neutral tones.

■ Use antiglare filters for the VDT screens as a last resort.

Pitts said most modern offices have three times more lighting than is appropriate for VDT work, and he strongly recommended ambient luminance of about 35-ft candles for VDT work.

Jitter and flicker

VDT purchasers should also specify terminals that reduce the jitter and flicker of on-screen characters, he said. Jitter is caused by an insufficient video reflection voltage, which makes the electron beam inaccurate when refreshing the character, Pitts said.

Flicker, he said, is caused by a fast decay of the phosphor and a slow refresh rate. "Accept nothing below 65Hz [frequency]. A lot of VDTs are 45Hz, 50Hz, [or] 55Hz, which is not a fast enough refresh rate," Pitts said.

On the controversial subject of screen color, Pitts asserted that displays with black characters on white screens provide the most legibility, visual comfort and work efficiency.

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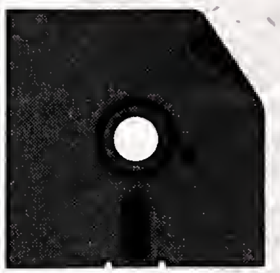
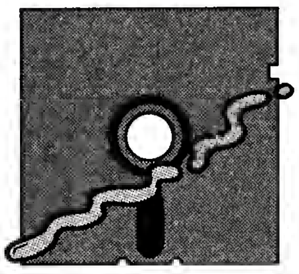
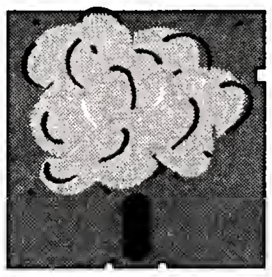
Aunt Molly's jam

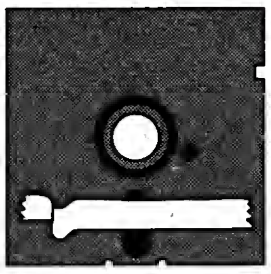

Dog-eared jacket

Regular coffee, two lumps

Maria's liquid cover

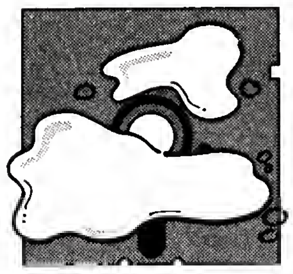

Hot dog mustard


Dust (cough-cough)

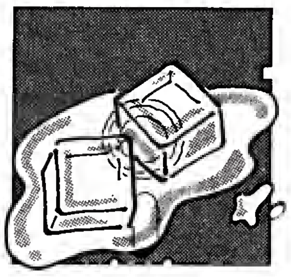

Tacky white tape

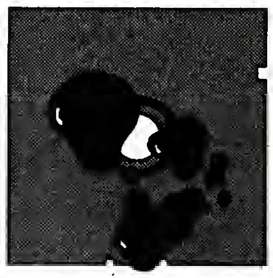
Boss's cigar ashes

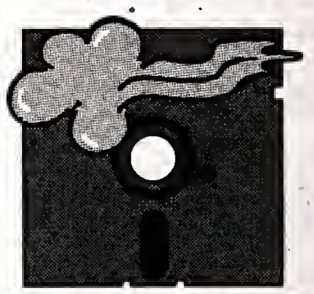
Dry martini, one olive

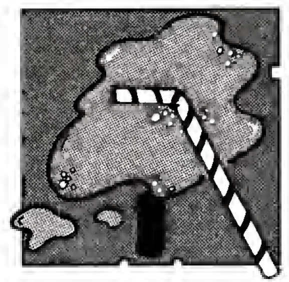

Spilled milk

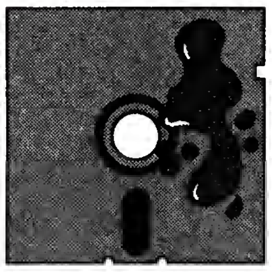
Potted plant–no pot

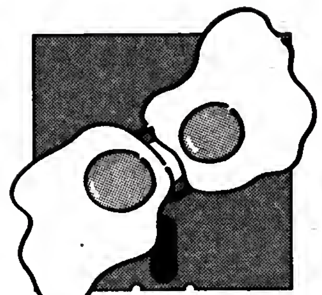

The big chill

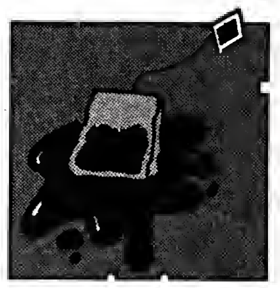

Lunchcounter ketchup

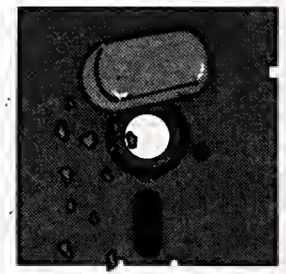

Clouds of smoke

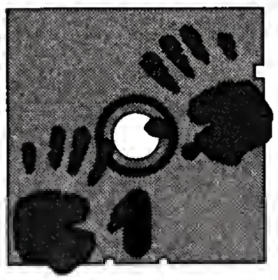

Fizzy orange soda


Waterbased ink spots

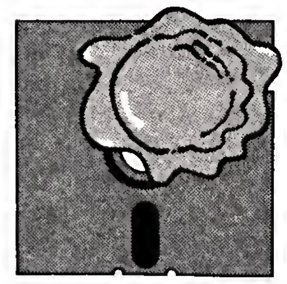

Sunny side up

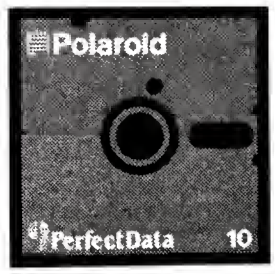

English breakfast tea


Eraser bits


Chocolate fingerprints

Sudsy soap bubbles


One scoop of ice cream



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Florida bill proposes electronic access into agencies

Residents may be allowed to tap into state records

By Donna Raimondi
CW Staff

TALLAHASSEE, Fla. — Any Florida government agency that wants to give residents remote access to computerized records can do so if a bill pending in the legislature here passes.

The bill, introduced in the 1985 session, seeks to permit, but does not mandate, all local, county and state agencies to give remote access to their electronic records to any Florida citizen with a computer, said the director of a committee studying the issue.

Edwin Levine, staff director of the Florida Joint Committee on Information Technology Resources, said the plan is not one of individual citizens dialing up to extract little bits of information. The system he foresees is one in which high-volume users of information — such as real estate professionals and large law firms — will have a direct line to the host computer on which the records are being maintained.

Levine's committee was set up three years ago to address planning for and implementation of computers in Florida government agencies, said Sen. George Stuart (D-Orlando). Last year, the committee addressed computer security issues, and this year remote access is the primary issue, he said.

If the bill passes, access to government records will continue to be free for people who come in to an agency and ask for the records, staff director Levine said. The proposed computer-access legislation calls for remote-access users, however, to pay direct and indirect costs to the agency from which they acquire information, so that the governments in Florida will not be in competition with private businesses that currently offer government information in a profit-making capacity.

The service would improve the quality of the state's computer systems, Stuart said, because needed equipment could be bought at the expense of the users and not at the expense of the taxpayers.

However, fees collected for this remote-access service would not revert automatically to the agency that generates the service, said Randy Esser, chief of the Bureau of Information Services for the Department of Highway Safety and Motor Vehicles.

All the money collected would go into general revenue, and there would be no change in the process of applying for more equipment, he said.

Common date set for spring meet

LOUISVILLE, Ky. — The IBM users group, Common, which claims to have members representing more than 3,000 IBM installations worldwide, will hold its Spring '85 Conference at the Galt House hotel here from April 27 to May 1.

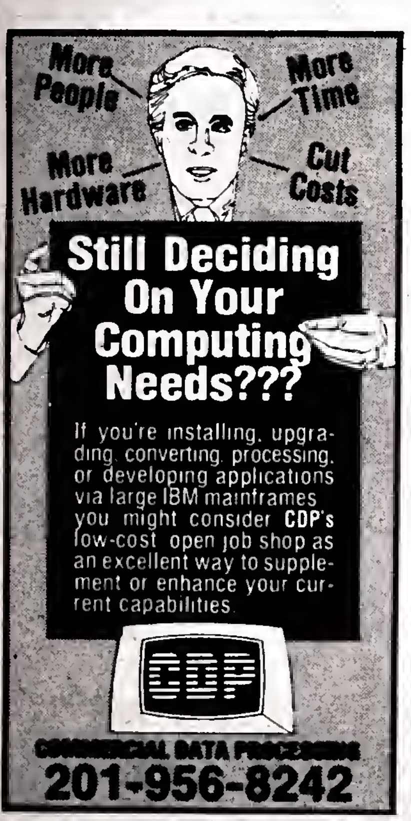
Common's membership includes users of the IBM System/34, System/36 and System/38, Series/1, 4300 series and Displaywriter as well as the IBM Personal Computer, according to the users group.

During the conference, more than 250 presentations are scheduled on management and applications topics. The faculty of Northwestern University will present special management sessions that will be eligible for Continuing Education Unit credits.

The registration fee for members is $130 in advance and $165 at the conference.

For those who are not members of Common, the fee is $200 in advance and $225 at the conference.

Further information on the IBM users conference is available from Spring '85 Conference, Common, which is headquartered at Suite 1717, 435 N. Michigan Ave., Chicago, Ill. 60611.



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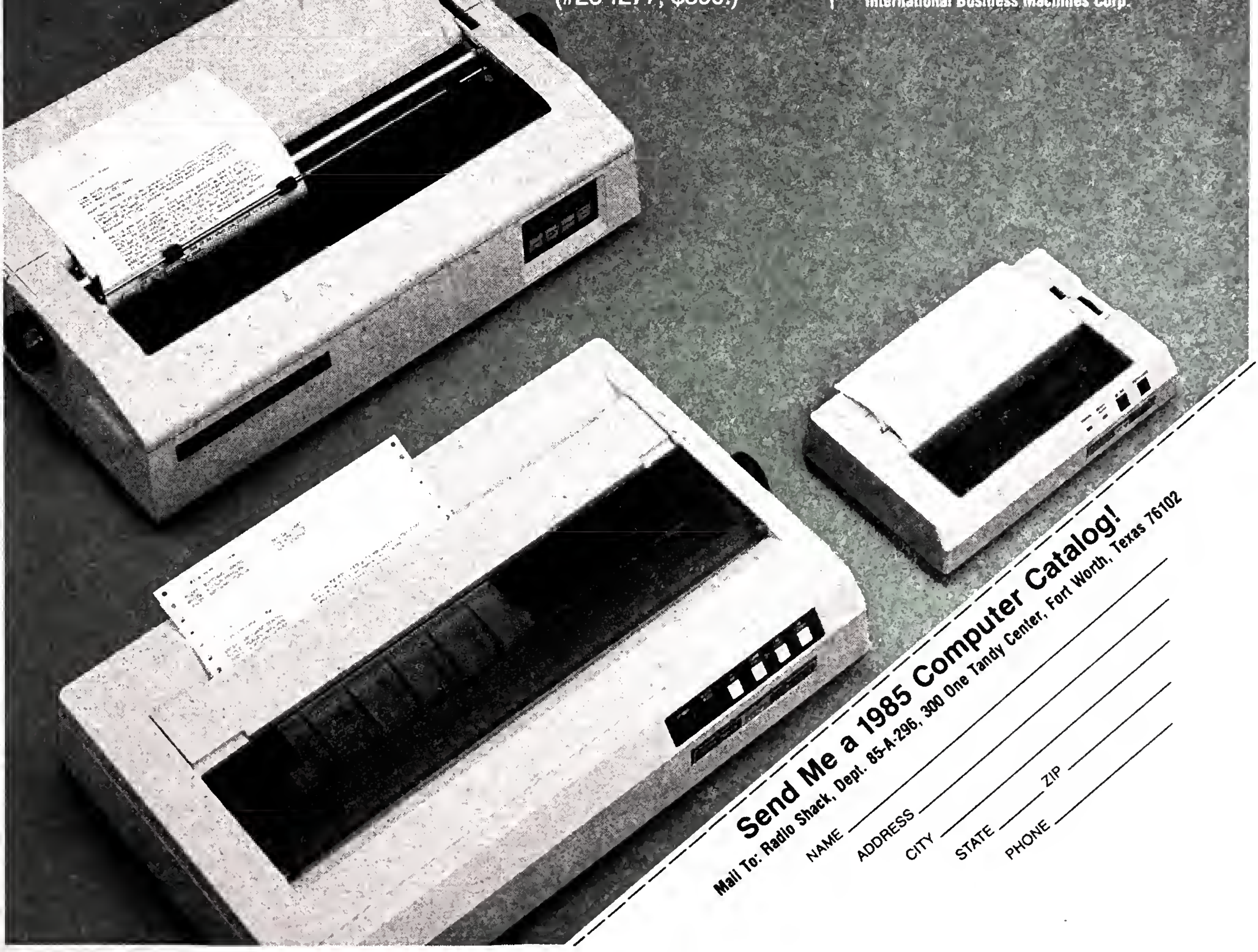
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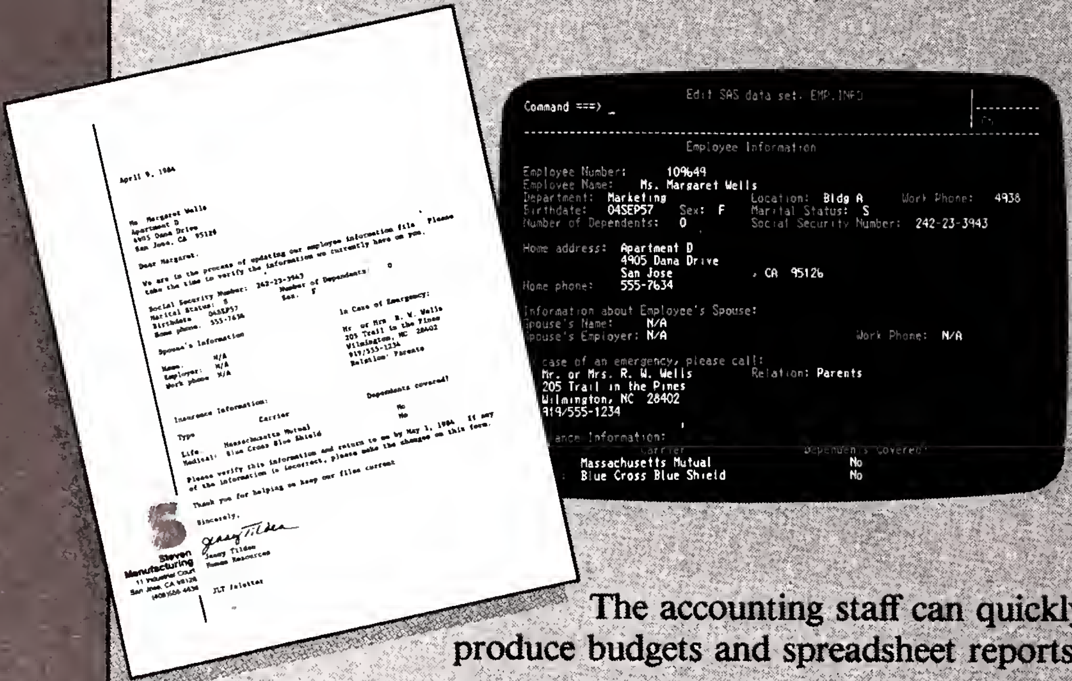

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Department:  Marketing             Location:  Bldg A     Work Phone:   4938
Birthdate:   04SEP57    Sex:  F    Marital Status:  S
Number of Dependents:   0          Social Security Number:  242-23-3943

Home address:  Apartment D
               4905 Dana Drive
               San Jose             , CA  95126
Home phone:    555-7634

Information about Employee's Spouse:
Spouse's Name:      N/A
Spouse's Employer: N/A                           Work Phone:  N/A

  case of an emergency, please call:
  Mr. or Mrs. R. W. Wells          Relation: Parents
  205 Trail in the Pines
  Wilmington, NC  28402
  919/555-1234

  ance Information:
          Carrier                            Dependents Covered?
      Massachusetts Mutual                          No
    : Blue Cross Blue Shield                        No
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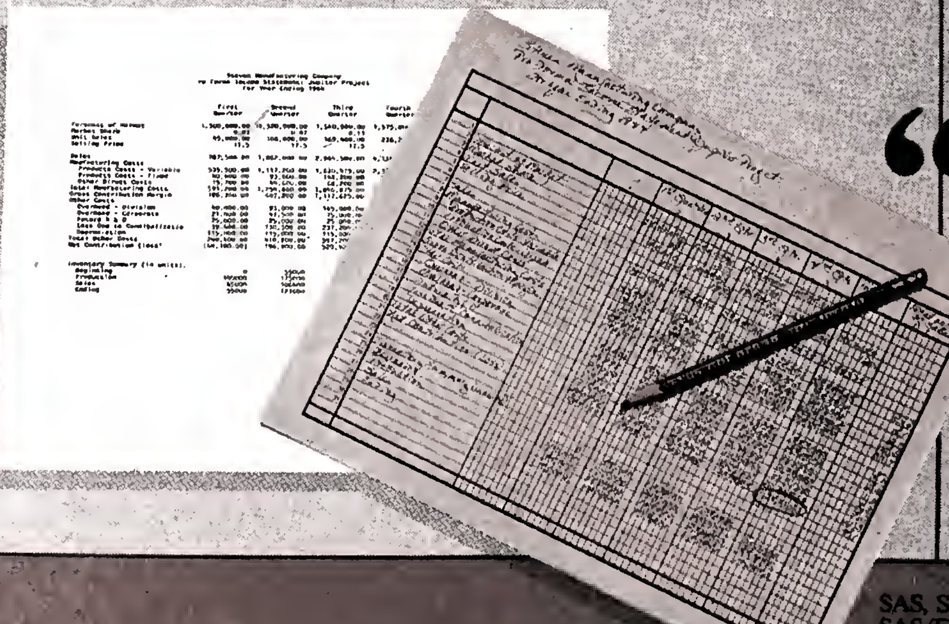

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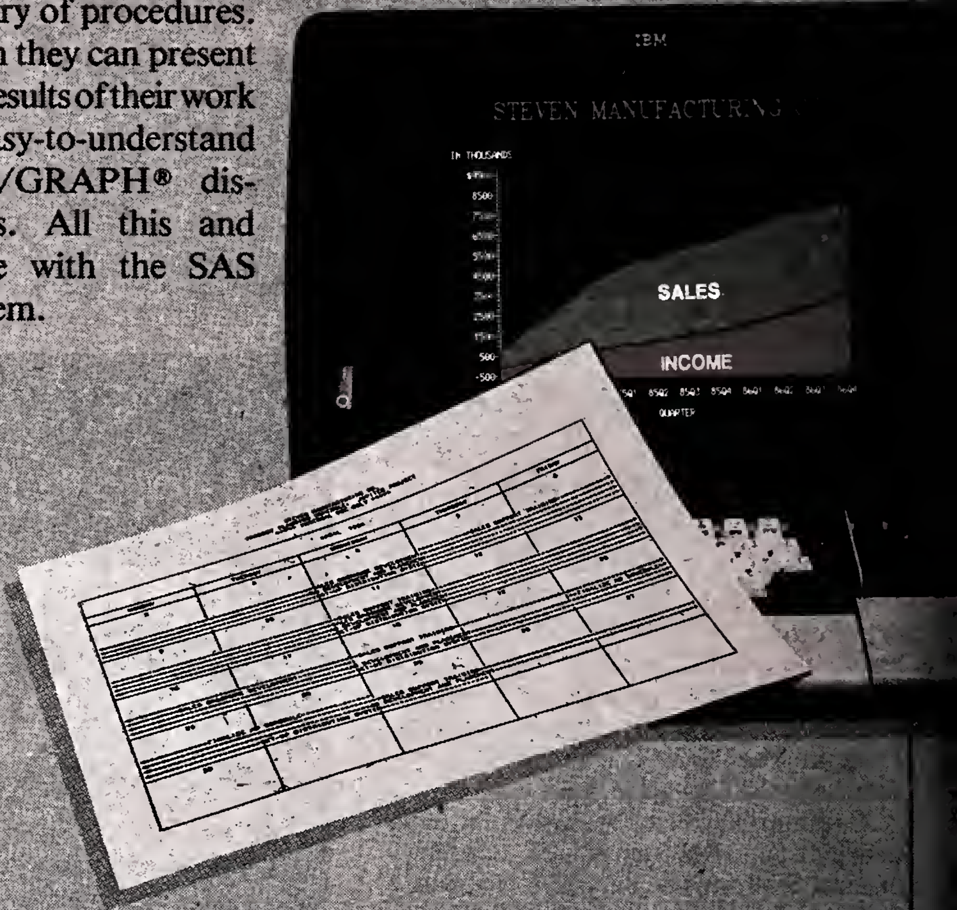

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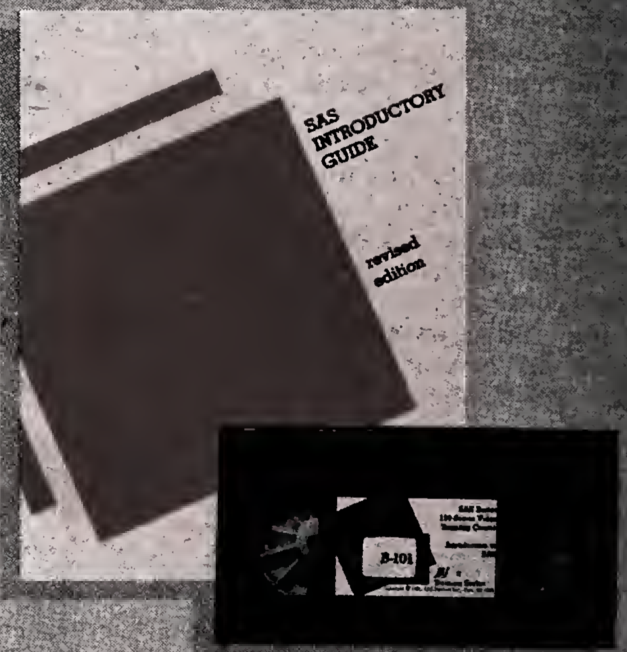

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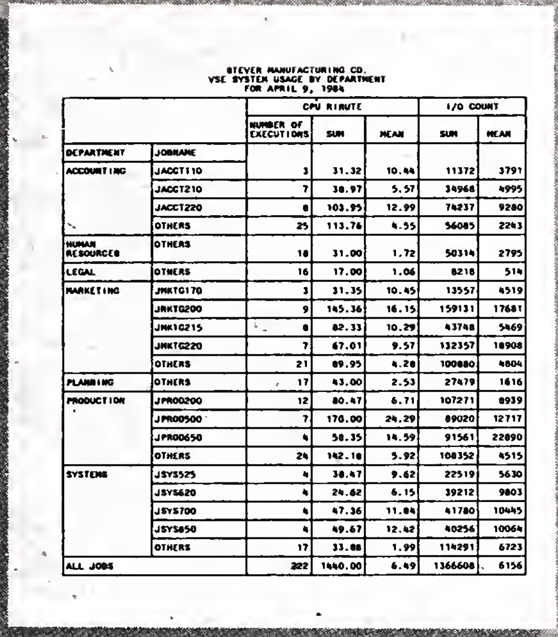

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FOR APRIL 9, 1984

		CPU MINUTE			I/O COUNT	
		NUMBER OF EXECUTIONS	SUM	MEAN	SUM	MEAN
DEPARTMENT	JOBNAME					
ACCOUNTING	JACCT110	3	31.32	10.44	11372	3791
	JACCT210	7	38.97	5.57	34968	4995
	JACCT220	8	103.95	12.99	74237	9280
	OTHERS	25	113.76	4.55	56085	2243
HUMAN RESOURCES	OTHERS	18	31.00	1.72	50314	2795
LEGAL	OTHERS	16	17.00	1.06	8218	514
MARKETING	JMKTG170	3	31.35	10.45	13557	4519
	JMKTG200	9	145.36	16.15	159131	17681
	JMKTG215	8	82.33	10.29	43748	5469
	JMKTG220	7	67.01	9.57	132357	18908
	OTHERS	21	89.95	4.28	100880	4804
PLANNING	OTHERS	17	43.00	2.53	27479	1616
PRODUCTION	JPROD200	12	80.47	6.71	107271	8939
	JPROD500	7	170.00	24.29	89020	12717
	JPROD650	4	58.35	14.59	91561	22890
	OTHERS	24	142.18	5.92	108352	4515
SYSTEMS	JSYS525	4	38.47	9.62	22519	5630
	JSYS620	4	24.62	6.15	39212	9803
	JSYS700	4	47.36	11.84	41780	10445
	JSYS850	4	49.67	12.42	40256	10064
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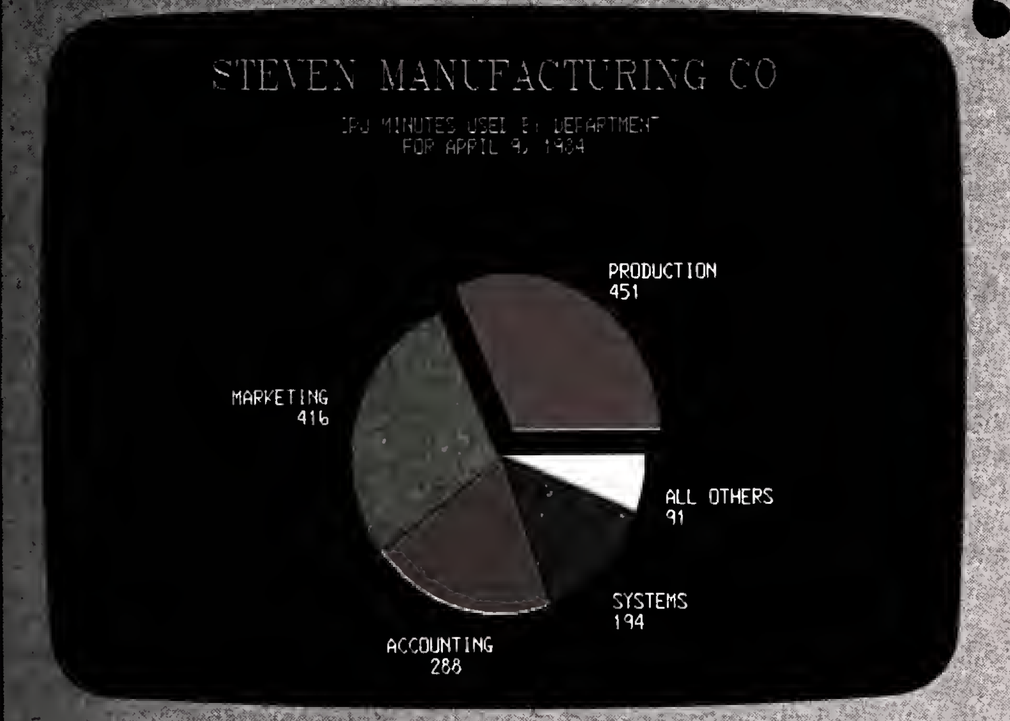
ALL JOBS		222	1440.00	6.49	1366608	6156



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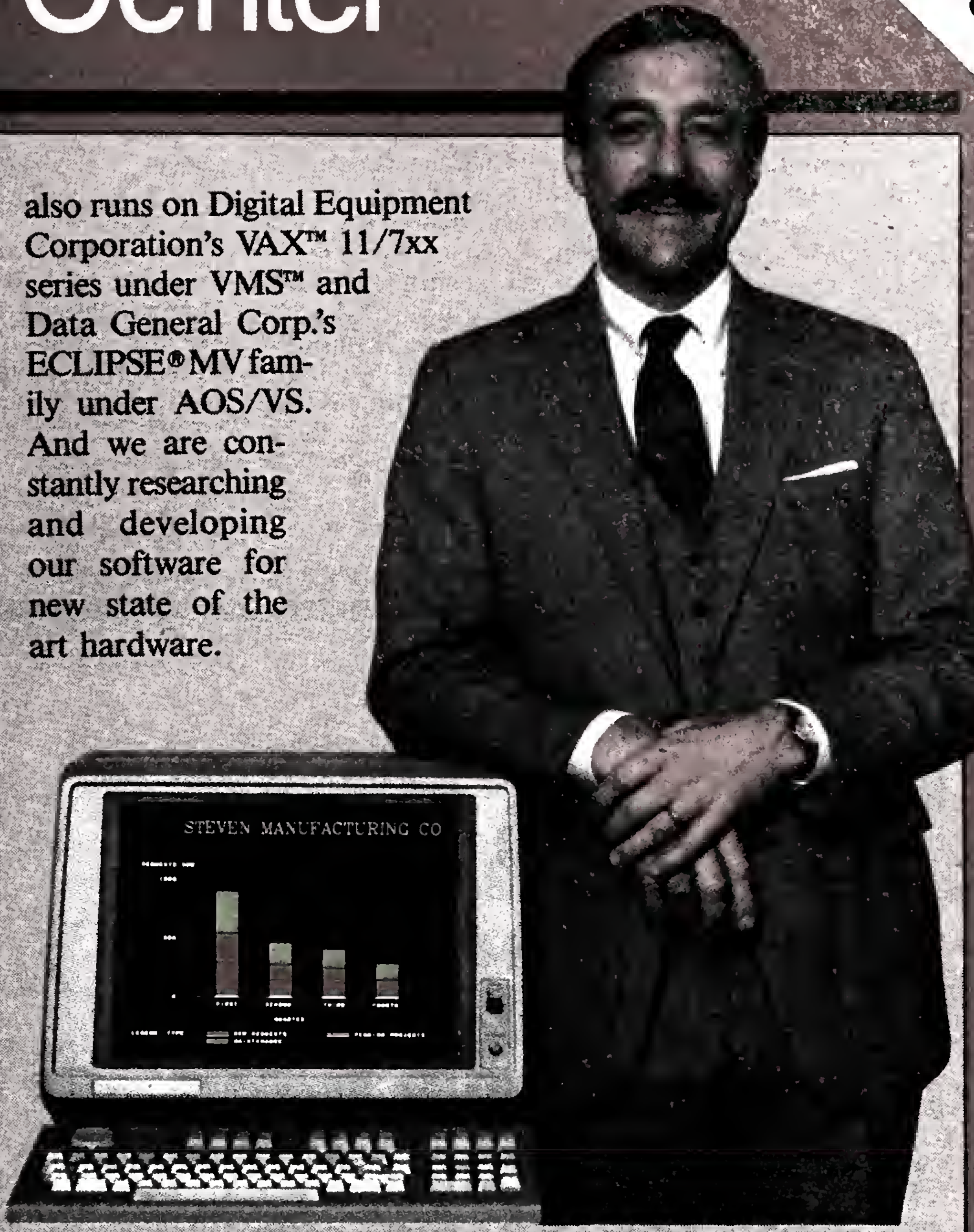

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Arizona county to cut ties with DP services contractor

By Jeffry Beeler
CW West Coast Bureau

PHOENIX — Government officials in surrounding Maricopa County, Ariz., have voted to sever all ties with the independent DP services contractor that was overseeing the county's computing operations for nearly three years.

When the break with Systems and Computer Technology Corp. (SCT) is complete, the county will reportedly revert to its former practice of maintaining its own captive information systems organization.

But to ensure a smooth transition from third-party management to in-house management, the county's disengagement from SCT is expected to be leisurely, according to Bill Hazelwood, the company's executive director.

Internal processing

For years, Maricopa County performed all its information processing activities internally. But in the early 1980s, the county's longtime computing services director unexpectedly resigned to accept a position in private industry.

When a subsequent personnel search failed to produce a qualified successor, members of the county's Board of Supervisors entered into a contract with SCT, a computing services firm based in Malvern, Pa.

Roughly three years later, a reconstituted board reversed the earlier decision and voted for SCT's eventual expulsion.

If the phaseout process goes according to schedule, the county's business relationship with its outside services contractor will end in June 1986, according to Hazelwood.

Divorce process slow

Both sides stress the need for pursuing the divorce slowly.

"You can't turn control of the computer services department back to the county all in one day, because the organization's management structure is now SCT's," Hazelwood said.

The demise of the county's DP services arrangement comes as little surprise to SCT. Each party originally intended the agreement to be temporary, and each expected SCT eventually to turn over the reins of the county's information systems department back to their owner, according to Hazelwood.

In fact, he added, the two sides insisted on including a "phase-back" provision as part of their original contract.

But the timetable under which the county would regain full control over its MIS destiny was deliberately left indefinite, Hazelwood said.

Now, in the wake of the Board of Supervisors' recent vote, the expiration date for the county's service contract is no longer open-ended, Hazelwood said.

'County at SCT's mercy'

What prompted the board to impose a firm cutoff date was a mounting suspicion that the arrangement "was placing the county at SCT's mercy," according to Dick Bryce, the governing body's executive assistant.

Ever since the contract took effect in May 1982, all the county's information systems employees have been on SCT's payroll.

In theory, therefore, the independent DP services company "could have shut down the county's entire computer operations," Bryce said.

Although the likelihood of such a closing was considered extremely slim, "the board members still wanted to exercise more direct, day-to-day control" over Maricopa County's MIS organization, Bryce said.

Aside from their concerns about control, the board members found little to criticize in SCT's performance.

In fact, in a recent audit by a Big Eight accounting firm, the services vendor won high marks for its management of the county's systems operations, he said.

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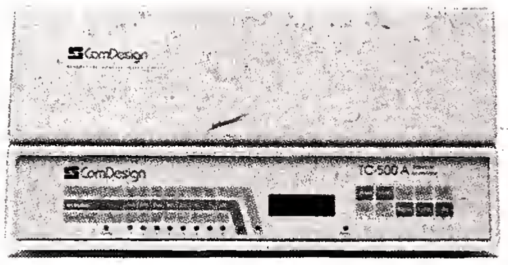

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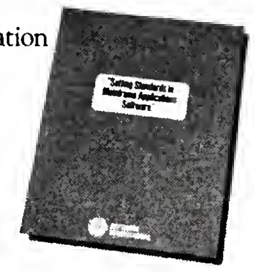

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CW4/1/85

SOFTWARE INTERNATIONAL

Software Thinking That's Impossible To Ignore

Package aids county's hunt for rape suspect

By Paul Korzeniowski
CW Staff

MIAMI — Investigators here have turned to a software package for aid in apprehending a man who may have raped as many as 40 women in the last 2½ years.

The package, IBM's Storage and Information Retrieval System (Stairs), provides ad hoc storage and retrieval capabilities for a large volume of text or data.

IBM recently donated a copy of the package to the Dade County Computer Services and Information System here. "There have been a number of unsolved rape cases that may or may not be attributed to one person," Thomas L. McGovern, Dade County's MIS director, said. "Investigators are attempting to determine if there are similarities in the cases that can be traced to one person or a group of people. A package like Stairs may help to determine this." McGovern would not comment specifically on how the package may be used, fearing that publicity would jeopardize the investigation.

In 1981, city agencies in Atlanta used Stairs to aid in the search for the person responsible for the murder of approximately 25 children. Richard Silvey, systems programmer and research analyst for the city's Office of Management Systems, was a member of a special task force formed to aid the investigation. "Whenever there is a case like the child slayings, police have to work with a large amount of data," he explained. "A lot of people called the police with information and tips. The department needed a system to input data, store it in a data base and allow the officers to query the data base. Stairs provided this capability."

The package was used with the city's in-house arrest and incident tracking data base management system. For example, an investigator could have the system list all males who own red, compact automobiles. "If the system produced 7,000 records, an investigator could have entered qualifying data to produce a workable number of records," Silvey said.

Silvey was not sure if the package helped lead to the man convicted of the slayings. "I don't think that the system produced one piece of information that allowed police to say 'That's our man,' but information about him was probably provided in some police records," the analyst noted.

When the child slaying cases were closed, Atlanta city agencies stopped working with Stairs, opting to use only the city's DBMS.

When Dade County began to evaluate Stairs, its IBM sales representative suggested that Dade County consult authorities in Atlanta. "Our IBM sales representative said that Dade County might call us, but they haven't called yet," Silvey noted. "We would be willing to work with them and show them how we established our task force, explain the functions it filled and illustrate how computers aided our investigation."

Bank saves time with software

PROVIDENCE, R.I. — A host of efficiencies have reportedly accrued for Fleet Credit Corp., the asset-based lending subsidiary of Fleet National Bank of Rhode Island, since it switched to on-line commercial finance software.

Fleet experienced a reduction of between 160 and 200 hours per month, compared with what had been spent in manual accounting and calculations — an average savings of more than 40 hours per week, according to Dennis Joyal, vice-president of the firm's business credit division.

Other advantages Joyal said the firm gained were access to on-line data to troubleshoot potential problems, the potential for loan managers to look at the components of entire transactions and the capacity to produce reports instantaneously, although most are printed out at night and delivered by 8 a.m. the following day.

No disruption of procedures

Fleet moved to computerization by putting its new software, including the Commercial Finance Package from Century Data Services, Inc. (CDS), on an IBM 3083 mainframe at its parent firm's headquarters. It has since found that new business can be handled by the system without disrupting procedures or requiring additional personnel, Joyal said.

The CDS Commercial Finance Package tracks and monitors Fleet's revolving asset-based loans. It gives the institution's loan administrators daily on-line access to information on loans, yield and income, regardless of the size of the portfolio.

The software permits the bank's demand deposit accounts (DDA) to interface with Fleet's Commercial Finance Program, Joyal said. Because customers of asset-based lending institutions often have accounts with the bank, Joyal said, Fleet finds it preferable to debit and credit their DDAs instead of billing them directly, he said.

Fleet Credit loan offices in Atlanta, Dallas, Minneapolis and Newport Beach, Calif., he added, are now linked with the Commercial Finance Package on the bank's mainframe, but they can only read historical data.

Fleet's back office, Joyal noted, has also benefited from automation. Immediate posting of transaction data helps prevent overadvances, provides audit reminders and frees the staff for additional duties, he said.

When Fleet moved to computerization and adoption of the Commercial Finance Program, it decided to use the bank's IBM 3083 mainframe rather than purchase an in-department micro or minicomputer, Joyal said. The main reason, he explained, was security though standardization and economy; the potential to network terminals nationally was also important.

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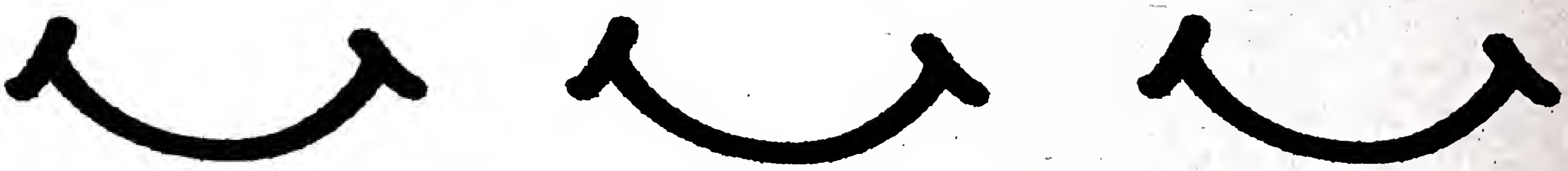
Last Thursday, Cullinet introduced a new way of managing information on an IBM mainframe that made DEC, Wang and DG users very happy.



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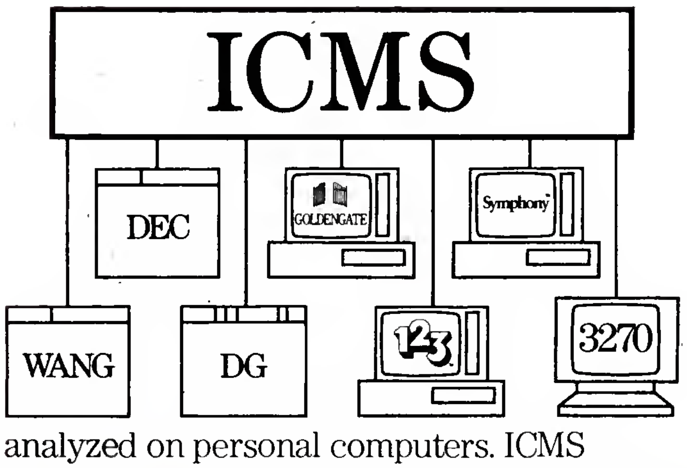

What makes ICMS so appealing to companies like DEC, Wang and DG is its *open system architecture*. A feature that finally makes intelligent communication between the mainframe and the minicomputer worlds possible. DEC, Wang and DG have all signed licensing agreements with us to develop and market ICMS links to their minicomputers.

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It's an unusual day when DEC, Wang, DG and Lotus users are all smiles about the same thing. But, then, as you can see, last Thursday was very unusual.

For more information about ICMS, phone us at 1-800-225-9930. In Massachusetts, the number is 617-329-7700.

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INTERNATIONAL REPORT
CW International
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AUSTRALIA

BRISBANE — Queensland's State Government Computer Center has ordered roughly $5 million worth of Sperry Corp. computer equipment, including the Sperry 1100/92 system and seven communications processors. The Government Computer Center needed the Sperry 1100/92 system to cope with heavy processing demands, which have been increasing at an annual rate of 30%, a spokesman said.

JAPAN

TOKYO — Toshiba Corp. and Sord Co. announced an agreement under which the two firms will cooperate on future research and development. Reportedly, Toshiba gained a 37.5% interest in Sord and has provided Sord with a new vice-president in addition to semiconductors, office automation equipment and peripherals. The companies have agreed to concentrate on micro technology and will work jointly on future development, production, sales and marketing.

SINGAPORE

SINGAPORE — Operation of this country's first national retail electronic funds transfer system is slated to begin in June. The $2.5 million pilot project is called EFT at Points-of-Sale (EFTPOS). The company coordinating the program, Network for Electronic Transfers Pty. Ltd., was formed by the five major banks that own EFTPOS. The network software is being supplied by Cap Information Systems, a spokesman said. The hardware front-end of the project consists of a three-CPU Tandem Computers, Inc. Nonstop II system, along with 50 model 9575 POS terminals from International Computers Ltd.

SWEDEN

STOCKHOLM — Swedish communications giant Ericsson AB is expected to announce two additional products: the Ericsson portable Personal Computer and an enhanced version of its Alfaskop terminal line, which is compatible with the IBM 3270 Personal Computer. The Ericsson portable is said to resemble — with the exception of its plasma screen — the latest offerings from Hewlett-Packard Co. and Data General Corp. It features a single 3½-in. microfloppy disk drive and runs under Microsoft Corp.'s MS-DOS operating system. Pricing was not available at press time.

In an unrelated announcement, Ericsson reported that 1984 corporate annual revenue was down 11% from the previous year.

■

STOCKHOLM — Four out of five top Swedish executives never use Personal computers at work, according to a report recently published here. In addition, some 51% saw no reason for executives to use personal computers on the job.

■

STOCKHOLM — The National Swedish Telecommunications Administration (NSTA) will offer computer training to its staff of approximately 44,000. The employees will reportedly be offered the opportunity to participate in workshops and will be able to take home personal computers during the training period. Employees will also be able to purchase home computers at discounted prices through the NSTA. "We want to prepare our employees for the information society and create an understanding of computerization," said Torbjrn Burlin, head of the NSTA project.

■

STOCKHOLM — Nordic Software AB has announced a software publishing and distribution agreement with U.S.-based QED Information Sciences, Inc. Nordic will translate and distribute QED's line of educational software for IBM Personal Computers and Apple Computer, Inc. Apple and Macintosh machines.

SWITZERLAND

ZUGERBERG — Computer Camp International, a San Francisco-based computer training institute, recently announced schedules for the first European computer camp to be held here. Two separate three-week sessions, designed to provide an indepth introduction to the Apple Computer, Inc. Macintosh, will be conducted July 15-Aug. 8 and Aug. 3-24.

The program offers classes in Basic, telecommunications, choosing peripherals, expandability options and how to use common applications programs such as word processors, data bases and spreadsheets. The camp is open to boys 14-17, and classes will be conducted in English and limited in size to eight.

WEST GERMANY

STUTTGART — Hewlett-Packard GmbH here greeted its 25th year in business by posting record results. Its 1984 revenue was up 42%, and profits rose 35%, sources reported. The West German HP also hired 700 employees last year and invested approximately $60 million in R&D. For the coming year, Chairman Eberhard Knoblauch predicted a company growth rate of approximately 25%.

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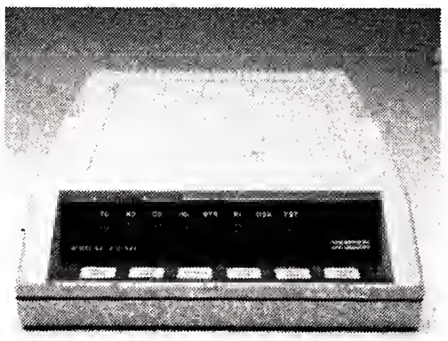

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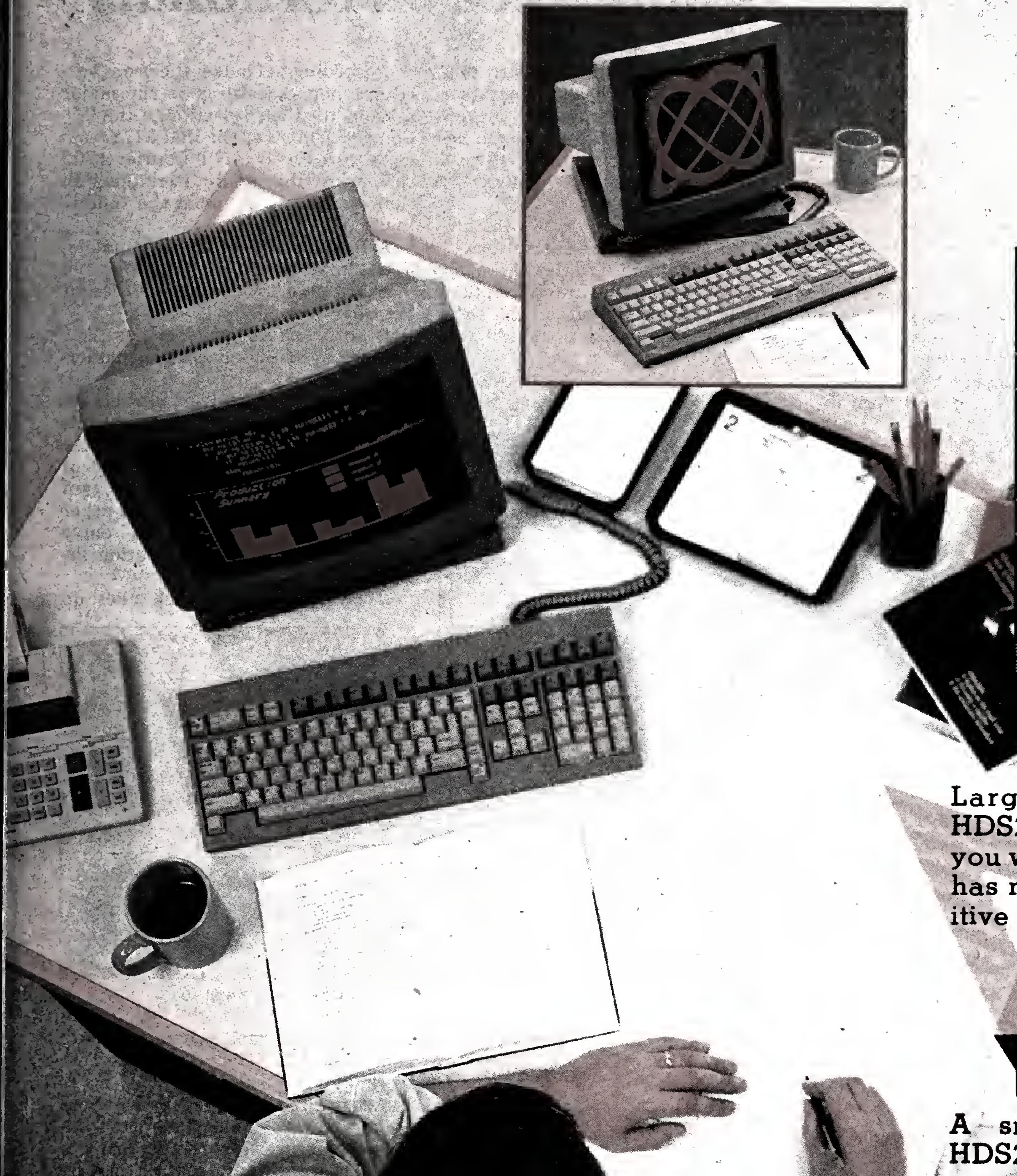

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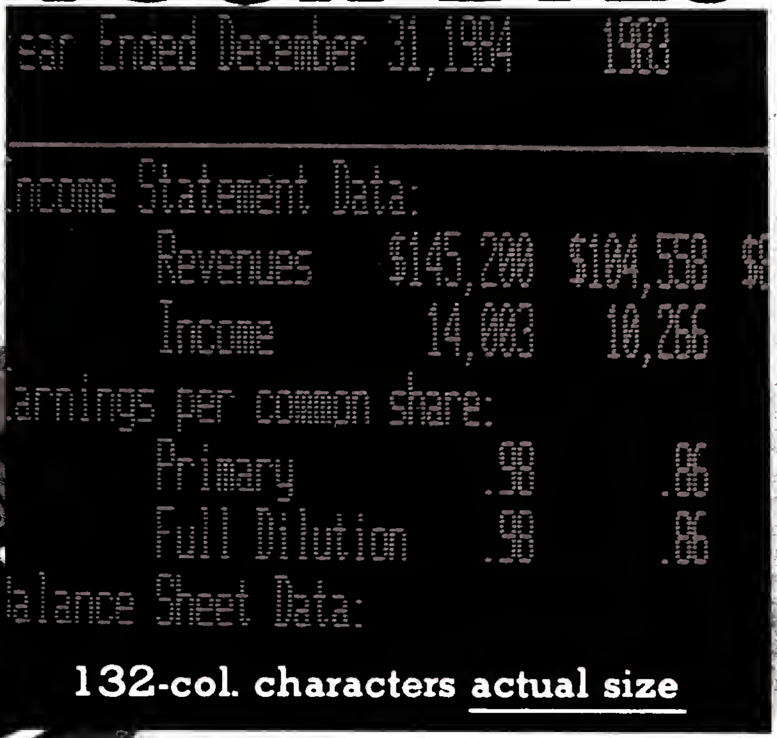

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ear Ended December 31,1984    1983

ncome Statement Data:
      Revenues    $145,200  $104,558  $
      Income        14,003    10,266
arnings per common share:
      Primary          .98       .86
      Full Dilution    .98       .86
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Insurance company consults employees on terminals

MILWAUKEE — While most data processing directors base their terminal purchase decisions solely on cost, service and other factors, one of the nation's largest insurance companies considered the opinions of 100 employees before purchasing ITT Courier Terminal Systems, Inc. 1700 display terminals.

Northwestern Mutual Life Insurance Co. based here asked data entry workers from 48 of the firm's divisions to try out the low-cost, standard display terminals of two vendors — ITT Courier and IBM.

According to Jeff Dunn, associate director of information systems for Northwestern Mutual, the result of the tryout was a determining factor in the company's decision to purchase 300 ITT Courier 1700 display terminals this past year.

"One hundred data entry workers compared the ITT Courier 1700 display terminal with the IBM 3178 display terminal. Ninety-eight percent of the users preferred the 1700," Dunn said. "We, of course, considered these statistics in our purchase decision."

Northwestern Mutual purchased the ITT Courier 1700 display terminals to replace its older Incoterm Model A66-01 display terminals at corporate headquarters. The terminals connect with an IBM 3081 GX running MVS with 24M bytes of main memory.

Chuck Foulke, Northwestern Mutual systems analyst and supervisor of the tryout, said the ITT Courier 1700 and IBM 3178 were selected because both ITT Courier and IBM were installed, compatible vendors at Northwestern Mutual.

Foulke said each tryout participant received a demonstration of each terminal and was then asked to perform a general insurance application. After working with each of the terminals, each user was asked three questions:

- Which terminal did you prefer?
- Why did you prefer that terminal?
- What features would you like to see on future display terminals?

According to Foulke, the users noted ergonomic features as the major reasons for their selection of the ITT Courier 1700 over the IBM 3178.

Features of the ITT Courier 1700 that were repeatedly mentioned in the comparison included the following:

- Physical size of the terminal.
- Clarity of the characters.
- Tilt and swivel capabilities of the CRT terminal.
- Positive tactile keystrokes.
- Separate 10-key pad for numeric purposes.

Connie Piskula, tryout participant and unit head of terminal operations for Northwestern Mutual's loan department, said the compact size of the ITT Courier 1700 was important in her choice because she and other Northwestern Mutual data entry workers have small workstation areas.

"The compact terminal takes up less desk space and provides a more comfortable, efficient place to work," Piskula said.

ITT Courier 1700 keypad

According to Foulke, the separate 10-key pad was one of the most important features among the data entry workers. He said that in the tryout, data entry workers from all departments said they believed the 10-key pad was a necessity in their areas of work.

Gloria Venski, tryout participant and supervisor of Risk Appraisal South, said several keyboard features were the deciding factors in her decision to choose the ITT Courier 1700.

"I thought the additional Enter key on the 10-key pad would be a time-saving device," she said. "Another feature I liked was the detachable keyboard. It had an extendable cable that let me place the keyboard up to five feet from the terminal."

Foulke said that data entry workers indicated a desire for more ergonomic features on future display terminals. "The most common response was for features that would reduce eyestrain and fatigue, such as a choice of color and varying character sizes," he added.

"We have some data entry workers that are on the terminals all day long. It's important for management to consider their needs when purchasing new terminals," Venski said. "The fact that management let us be a part of the purchase decision meant a lot to everyone."

"Surveying the actual users was unique for our company," Foulke said. "We received very positive feedback from both supervisors and users."

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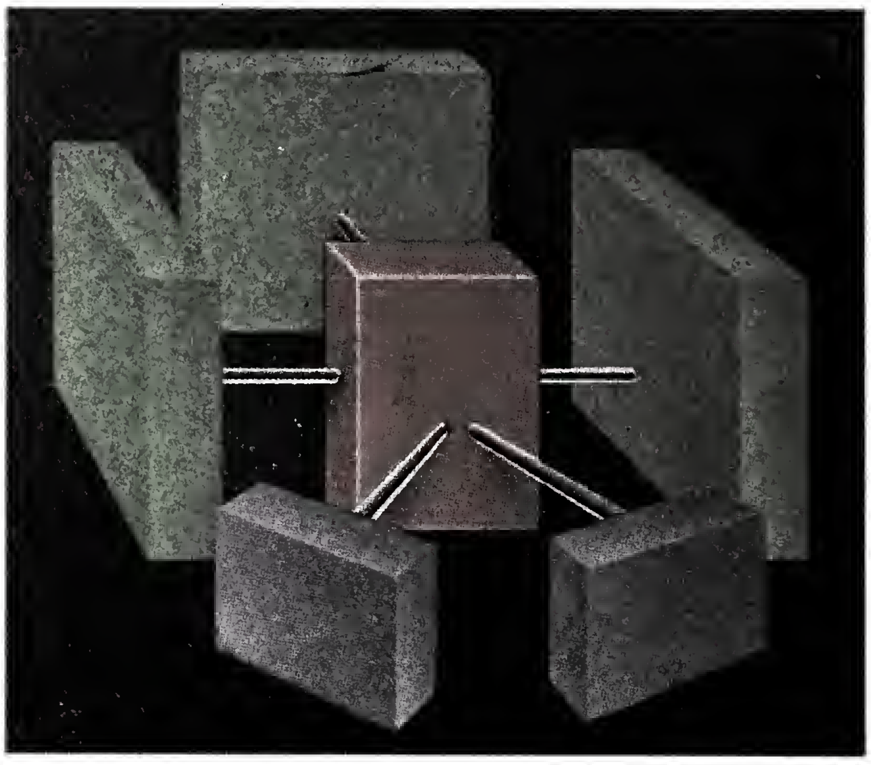

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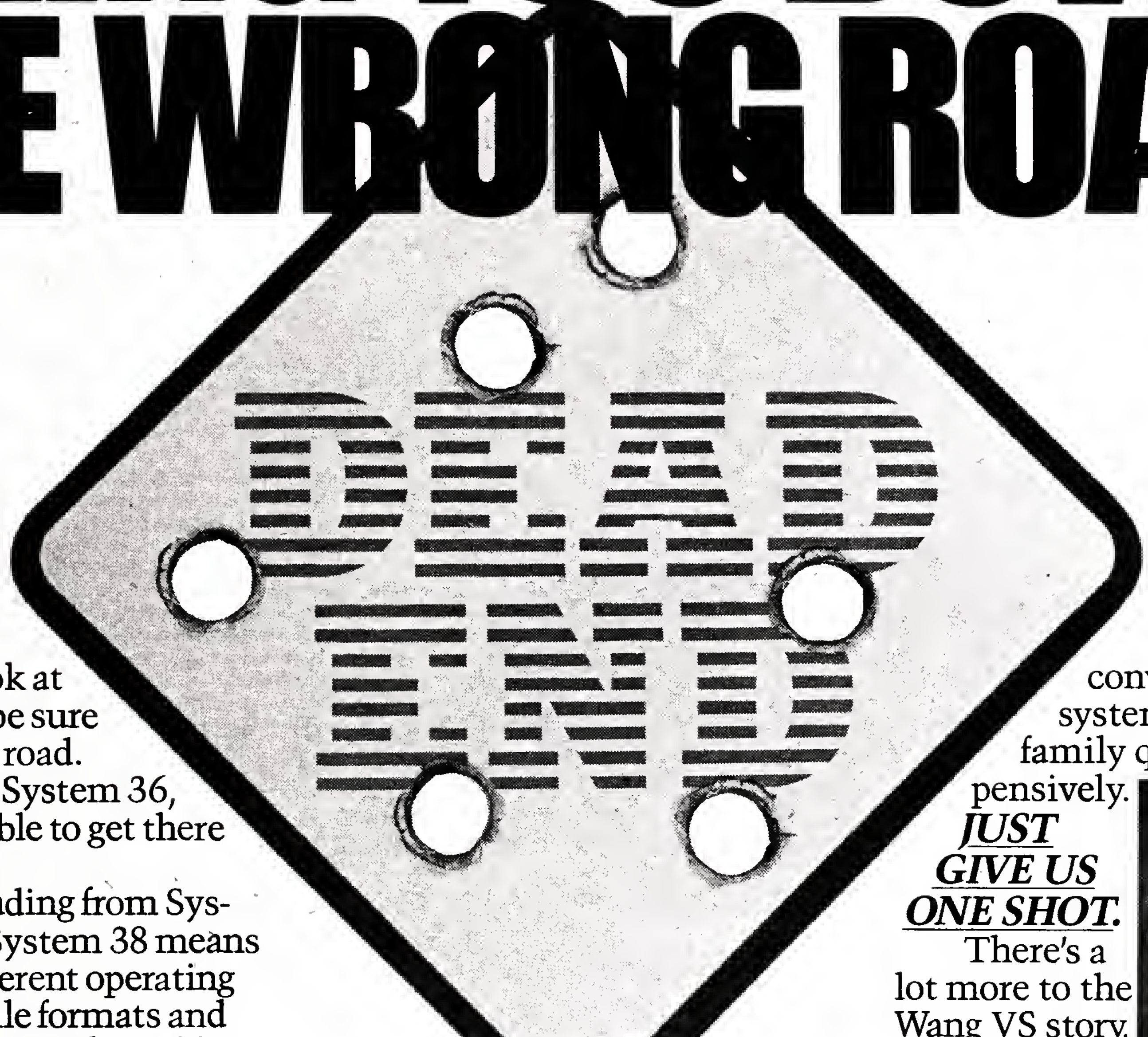
IS YOUR IBM OFFICE SYSTEM TAKING YOU DOWN THE WRONG ROAD?



Before you look at IBM's System 36, be sure you look down the road.

Because with System 36, you might not be able to get there from here.

You see, upgrading from System 36 to an IBM System 38 means converting to a different operating system, different file formats and different software. Which could mean months of retraining and downtime. (Not to mention a considerable investment.)

And if you want to grow from System 36 to an IBM 4300, things can get even more complicated.

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FEATURES	WANG VS 85	IBM SYSTEM 36
Migration without conversion up to 192 users	Yes	No
32-bit Architecture	Yes	No
Cache	Yes	No
Object Code Compatibility	VS 15, 25, 45, 65, 85, 100, 300	36 only
Virtual Memory Operating System	Yes	No
Removable Storage Options	Yes	No
Local Area Networks	Yes	No
Architectured for OA/DP	Yes	No
Relational Data Base	Yes	No
Industry de facto Standard Word Processing	Yes	No

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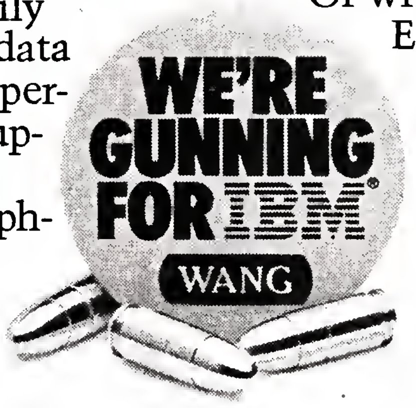

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Acme Boot production facility

Boot maker's system sends waste walking

CLARKSVILLE, Tenn. — With the help of a manufacturing resource planning system, the world's largest bootmaking company is striding confidently toward improved manufacturing operations and lower costs.

With manufacturing operations at eight plants in Tennessee, Texas and Massachusetts, Acme Boot Co. crafts more than four million pairs of boots each year. The boots are marketed under a variety of brand names, including Acme, Dingo, Dan Post and Lucchese.

Acme maintains a data processing center for its manufacturing operations at its headquarters here, with an Amdahl Corp. 470V/5-II mainframe running IBM's OS/VS1 and VM/CMS under IBM's CICS. The data center also uses Cincom Systems, Inc.'s Total data base management system. Workstations in the remote manufacturing facilities are tied into the Amdahl mainframe via communications lines.

Acme offers more than 4,000 styles of boots with a host of different sizes and individual variations, and management must control a variety of materials in inventory. Each of Acme's manufacturing plants employs approximately 250 workers on a piecework incentive basis.

With the far-flung and diverse nature of Acme's manufacturing operations, the company encountered some nagging problems such as poor inventory turns, inaccurate inventory planning, increasing paperwork, higher-than-desired labor costs and inadequate tracking of work in progress. In an effort to counter these, Acme decided to implement Cincom's Manufacturing Resource Planning System (MRPS).

Cincom's MRPS is a closed-loop production and inventory control system that incorporates seven functional modules:

- Inventory control.
- Bill of materials.
- Master production scheduling.
- Material requirements planning.
- Cost management.
- Shop floor control.
- Purchasing.

According to Larry Miller, director of manufacturing systems at Acme, prior to the implementation of MRPS, Acme workers used manually produced work tickets to indicate the completion of various steps in the boot-making process.

Today, Acme's workers use computer-generated work tickets that are more accurate and easier to read, Miller said.

"The work tickets provide the data that the payroll department needs to determine compensation for each worker," Miller said. "The migration to automated paperwork is definitely having a positive effect on Acme's direct labor costs.

What Miller labeled as indirect labor savings are also being realized with MRPS. At Acme, boots are manufactured in 12-pair cases and, at various points in the manufacturing process, a pair may be pulled from the case for defects or for reworking.

"In the past, when a defect — or 'back shoe' — was identified, it still was common for our inventory to maintain the original 12 pairs, even though there were now only 11 pairs," Miller said.

Miller said the ability to track pairs of boots accurately throughout the manufacturing process has substantially reduced the indirect labor costs involved in reworking back shoes.

According to Purchasing Manager Robert Bryant, annual inventory turn rates have improved since the company implemented MRPS.

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- Our computer consulting firm was founded in 1967. Sales have grown to over $18M in 1984.
- We recently announced the appointment of Richard "Dick" Dougherty (formerly of IBM) as Vice President of Corporate Development.
- We have offices in Philadelphia. New York. New Jersey. Washington. D.C.. Virginia: we are opening a new office in Los Angeles in May '85 as part of our expansion plans. which also include additional locations by 1987!
- Donald Lee (formerly of IBM) has been appointed Vice President - Western Operations as of May 1. 1985.
- We have an outstanding management team consisting of: Ed Amarnick. Jack Bokinsky. Jim Craig. Dick Higdon. Paul Magnuson. Brendan Morgan and Dick Quigley.
- Our employees enjoy outstanding benefits including an attractive Employee Stock Ownership Plan.
- We provide a wide range of data processing professional services including management consulting. application development. systems support. and training.
- Our name is synonomous with assurance of quality performance and timely. dependable completion of projects and assignments.

HELP ME WIN MY BET. Write our name on the coupon below. read the rules carefully and mail in your entry. In the event that more than one correct answer is received. a random drawing will be held on June 20. 1985 at the Trenton Country Club (Trenton. NJ) at 7:30 p.m. Thank You.

Bill Pinkerton. President

One entry (or facsimile) per contestant. Entries must be received no later than June 15, 1985. Sponsor not responsible for lost or delayed entries. Winners will be selected from a random drawing from all correct entries received. Winners need not be present. Odds of winning determined by number of correct entries received. Prizes are not transferable. No substitutions. Taxes are the sole responsibility of winners. Winners will be notified by mail and will be required to sign an affidavit of eligibility and release. Winners may be required to consent to use of their name or likeness for advertising and trade purposes without compensation. Void where prohibited or restricted by law. Must be 21 years of age. Open to all residents of the U.S.A., except our employees, past or present, their families and those of our affiliates, and our advertising and promotional agencies. Drawing is subject to all federal, state and local laws.

WHO ARE WE? ____________________

Your Name ____________________

Address ____________________

Phone ____________________

☐ **Resume Enclosed.** Please enter me in the $5,000 drawing.
☐ **Resume Not Enclosed.** Please enter me in the $2,500.00 drawing.

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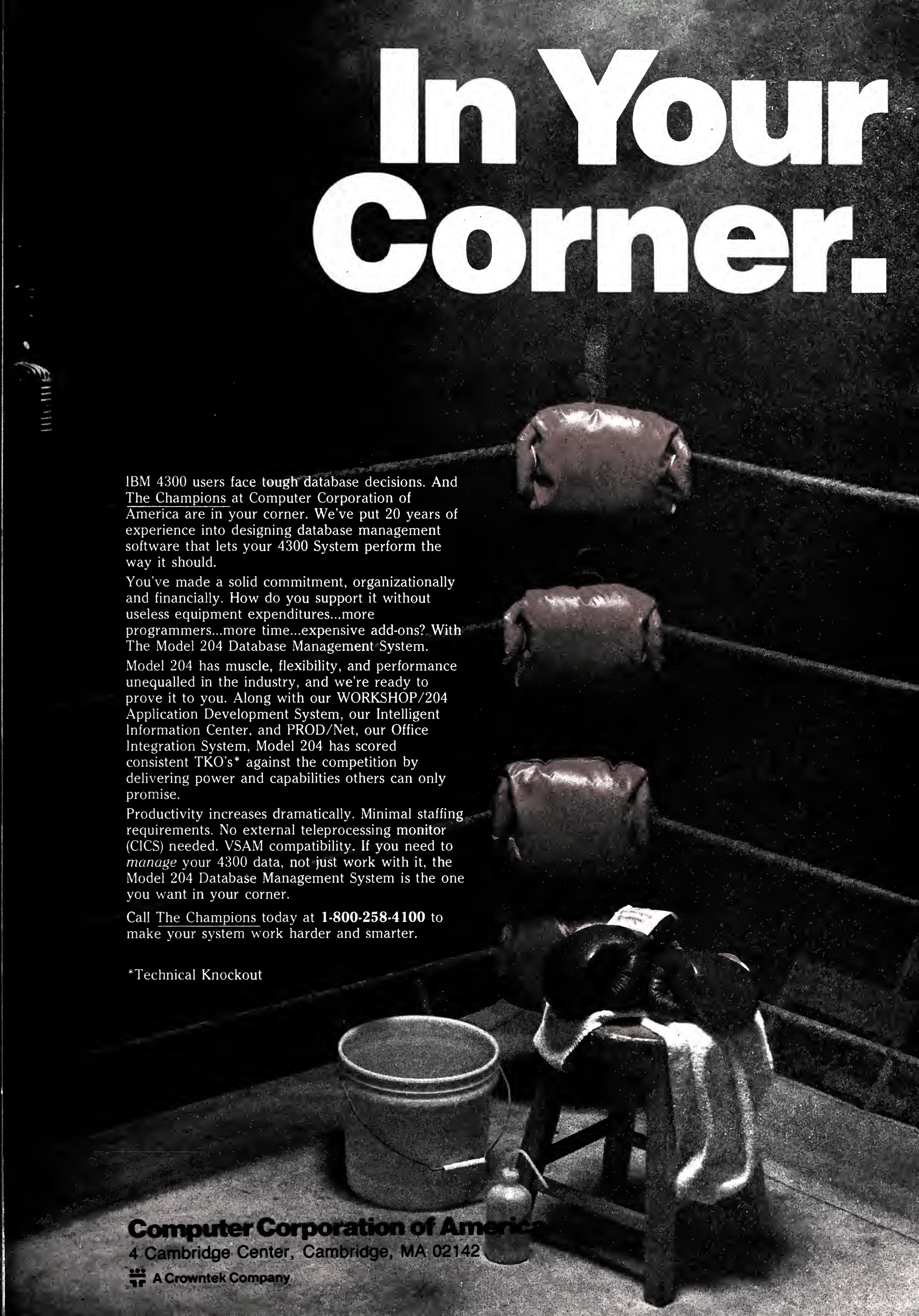

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Software AG Users spell it out...Datapro™ survey rates ADABAS

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Seafood chain hooks up with CAD to draw blueprints

LEXINGTON, Ky. — A seafood restaurant chain based here designs its outlets with the help of computer-aided design systems.

Long John Silver's Seafood Shoppes in neighborhoods across the nation have been designed with the aid of Cadam, Inc.'s computer-aided design and manufacturing (CAD/CAM) Cadam and a Spectragraphics Corp. terminal running off IBM mainframes at Jerrico, Inc. headquarters here.

Jerrico has more than 1,300 Long John Silver's outlets and another 74 Jerry's Restaurants throughout the U.S. In 1981, the company found its architectural drawing capabilities taxed by its rapid expansion.

Jerrico architects recommended a CAD system to reduce the need for original drawings and to increase architectural productivity. Standard areas in each restaurant, such as dining areas, kitchens and lobbies, would not have to be redrawn.

The search for a solution began in the fall of 1981. Three types of systems were researched:

- Microcomputer-based.
- Minicomputer-based.
- Mainframe-based.

The micro-based systems were ruled out because their storage capacities were too small to support Jerrico's long-term drawing storage needs.

A typical set of restaurant building plans contains approximately 30 drawings, some with up to six overlays per drawing, which would have quickly exhausted the limited drawing storage capacity of a micro system. In addition, microprocessor speeds at that time were too slow and could only accommodate simple drawing tasks.

Research into minicomputers led Jerrico to consider Computervision Corp., a vendor of turnkey CAD systems. Computervision's system's advantages included a special architectural engineering software package, high-quality drawing techniques, color terminals, a user-friendly programming language and a training package. The disadvantages of the proposed system were its somewhat limited on-line drawing storage capacity, limited data integration with other Jerrico data bases and slower terminal response than a mainframe system. Additionally, significant expansion would have required a second system.

Mainframe systems offered more promise. The IBM system ran Cadam, a program that offered the speed and power Jerrico wanted. It also had the advantage of being compatible with Jerrico's IBM 4381 Model Group 2 host and with IBM terminals engineered for rapid response. Thus, data entered though Cadam could be shared with other Jerrico data bases, and all restaurant drawings could be stored on-line using IBM 3380 disk drives.

Cadam's compatibility with IBM and IBM plug-compatible equipment, however, proved to be the deciding factor, leading Jerrico to launch a 12-month test of an IBM mainframe-based system. It included four IBM 3250 terminals, Cadam software and a California Computer Products, Inc. black-and-white plotter. Jerrico said it believed at the time that it selected the best performing system for the money but soon discovered other alternatives.

Performance advantages

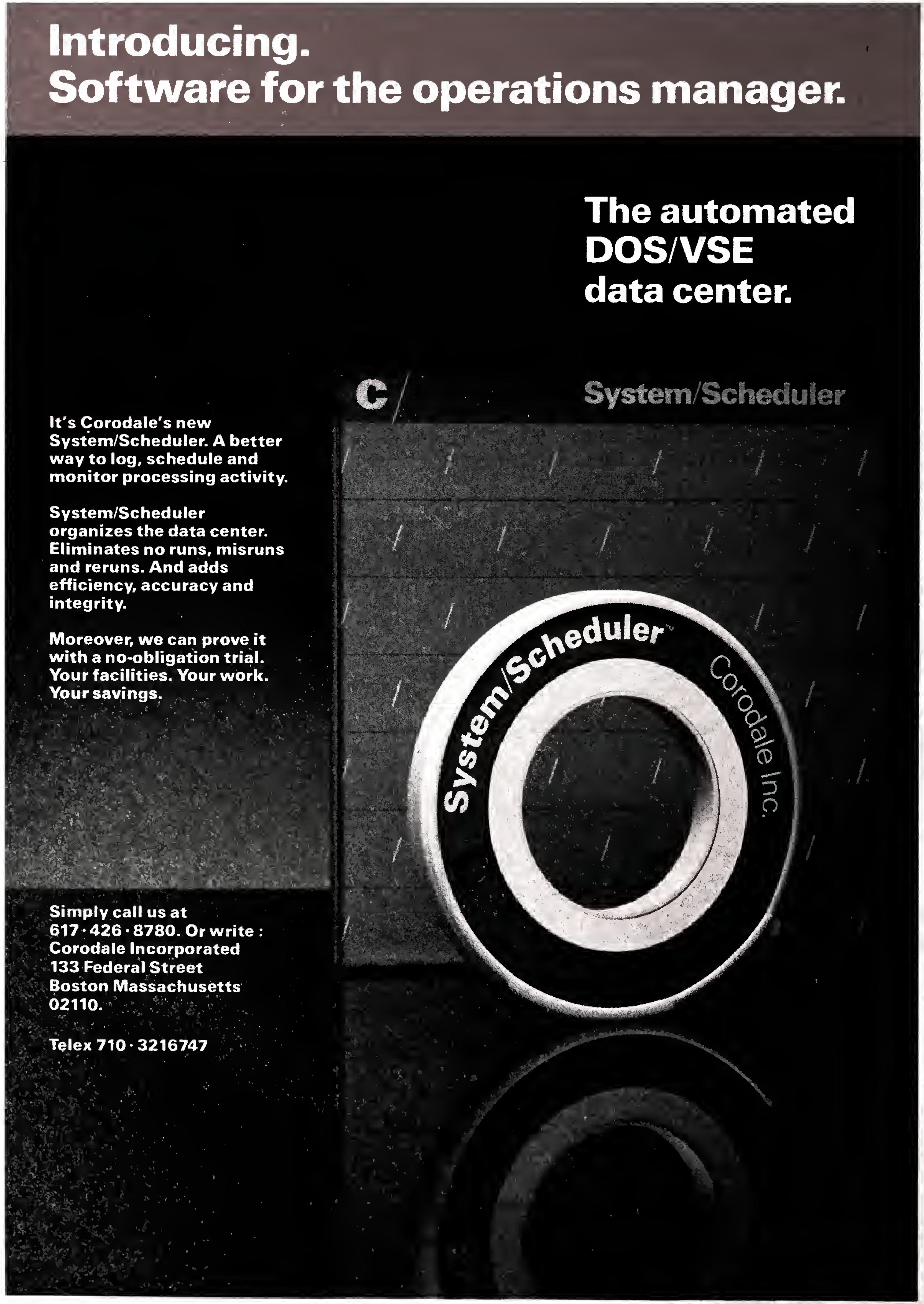
Six months later at a CAD graphics show, Robert Taylor, an associate architect at Jerrico, looked at Spectragraphics's System 1250 terminal and found that it offered performance advantages. It emulated the IBM 3250 monochrome stroke system and supplied IBM CAD/CAM users with the versatility of color and more displayable vectors. The System 1250 also provided a higher resolution display, real-time raster screen updates and a modular design that allowed several workstations to be connected without flicker or significant losses in controller performance. Also, input from keyboards, function switches, light pens and data tablets were all supported.

In addition, the Spectragraphics System 1250 incorporated the 3250 order set, plus its own expanded orders, which allowed for color designs and the generation of wide lines, large points and area fill.

Taylor, however, was most interested in the System 1250's upgrade capabilities and in particular its ability to support an upcoming release of Cadam that would allow for up to 11 distinct shades of gray on a monochrome screen.

Taylor and Jerrico's data processing department discussed the matter and concluded that Spectragraphics' equipment was the best choice, because it allowed the company to grow with the future releases of Cadam. The company installed four Spectragraphics monochrome 1250 terminals in May 1983, and recently Jerrico added another monochrome 1250 and a color 1250. Today, some 50 fully operational Long John Silver's Shoppes have been designed using a System 1250, and 10 of the company's 17 draftsmen on day and evening shifts use the 1250s full time.

Taylor said, "The ability to isolate and copy standardized elements is the key. Maximum productivity is based on making one original drawing do the work of dozens."



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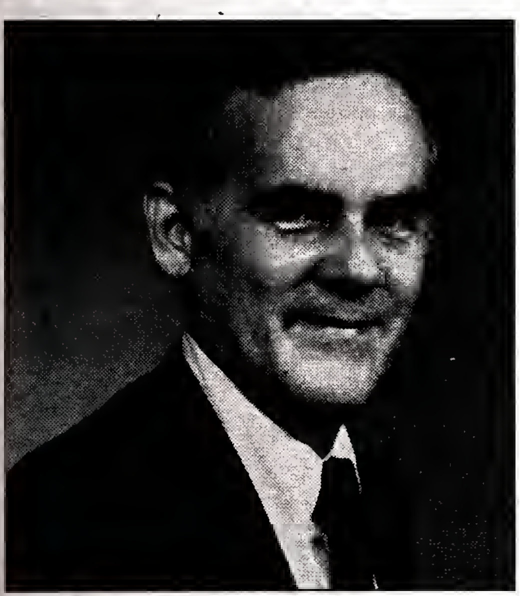
MANAGERS ON THE MOVE

RICHARD T. PALMER has been appointed vice-president of management information systems for the Colgate-Palmolive Co. His new responsibilities will focus on furthering maximum productive use of computer technology in all facets of the company's business. Associated with Colgate since 1981, Palmer joined the company as director of MIS.


Palmer

Prior to joining Colgate, he was president of administrative services at Bradford National Corp. for two years. He was previously with Merck & Co., where his last post was senior director of MIS. Palmer is a graduate of Wayne State University.

■

Staley

SUSAN STALEY has been named director of data processing at Execucall, Inc. in Cincinnati. She will have overall responsibility for Execucall's IBM System/35 computer.

Staley began her career with IBM and joined Execucall from the Delta Queen Steam Co., where she was data processing director.

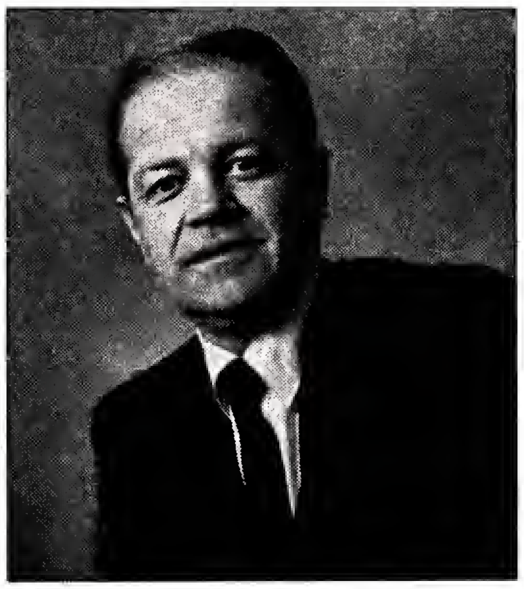
She earned a bachelor's degree in economics from Wilmington College.

■

T. P. ORLOWSKY has been appointed director of management information systems for Transco Group, Inc. He is a specialist in systems design and analysis. In his position, he will design, program and maintain systems for Transco that apply to the transportation industry.

Orlowsky previously served as project manager for Panalpina, Inc. He has also been associated with Gran Colombiana, Inc., and U.S. Lines.

A graduate of the State University of New York at Farmingdale, Orlowsky received an associate applied science degree in computer science.


Orlowsky

Intech '85 expo scheduled

SAN FRANCISCO — Intech '85, the third annual Integrated Information Technology Conference and Exposition, will be held Aug. 26-29 at the Moscone Center here.

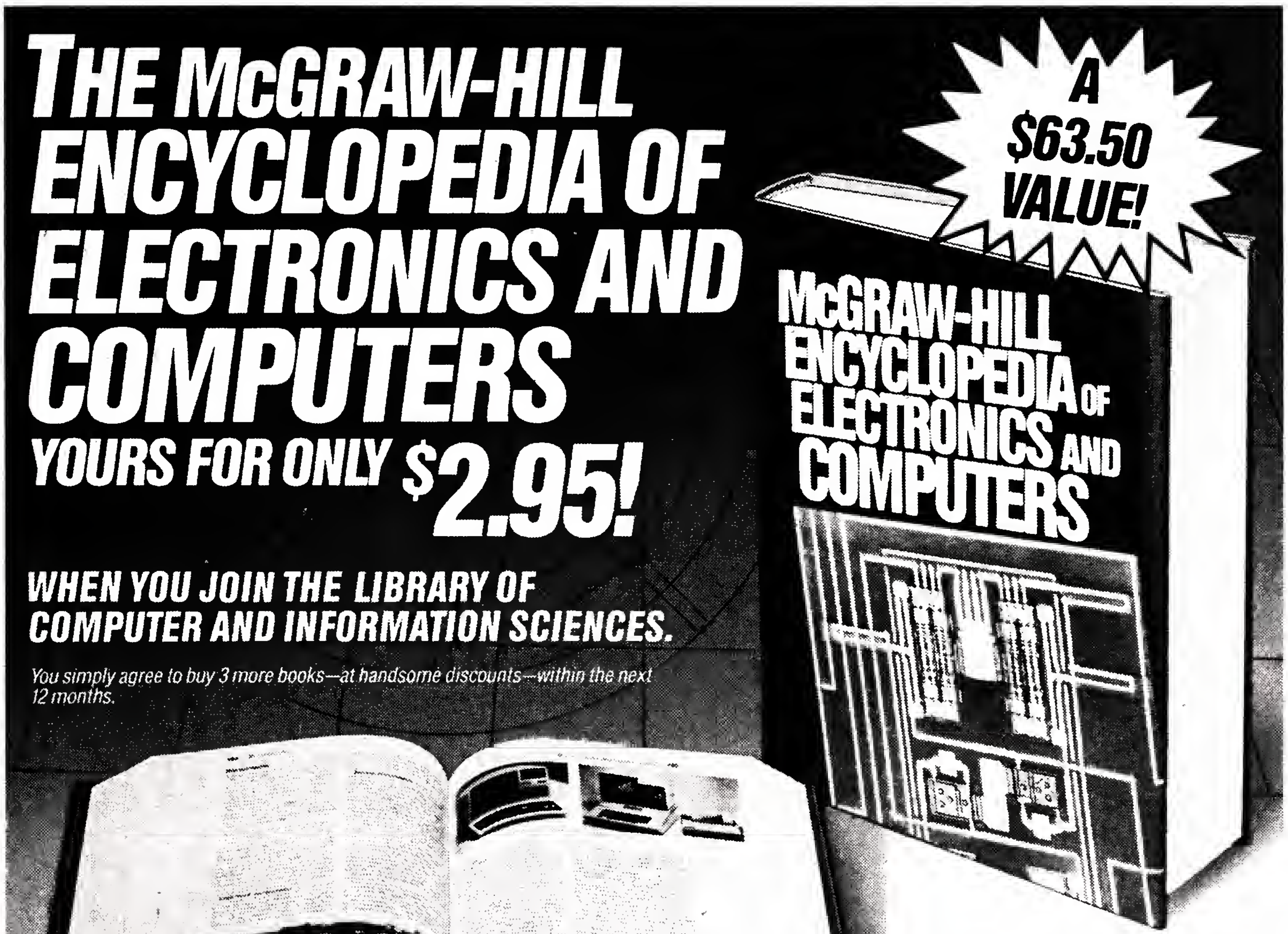
The conference will focus on business solutions in major user applications. Topics to be covered in lectures and discussion groups include information security, networks, personal computers, integrated voice/data networks and managing the technology. Representatives of Boeing Computer Services Co. will discuss strategy for migrating to standards. User case histories are scheduled from Westinghouse Electric Corp. and Ford Aerospace & Communications Corp.

The exposition will include floor demonstrations of integrated voice/data systems, personal computer-to-mainframe connections, personal computer local-area networks and advanced security technologies.

The conference also includes a two-part program on computer and communications alternatives with participation by IBM and AT&T system users and vendor technical personnel.

Registration fee for the conference is $495, and admission to the exposition is an additional $10.

More information is available from National Trade Productions, Inc., Suite 400, 2111 Eisenhower Ave., Alexandria, Va. 22314.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CALL FOR PAPERS

EXPERT SYSTEMS IN GOVERNMENT SYMPOSIUM
McLean, Va., Oct. 23-25

Papers are being sought for this conference sponsored by the IEEE Computer Society, Inc. and Mitre Corp. in cooperation with the American Institute of Aeronautics and Astronautics/National Capital Section. This conference will offer high-quality technical exchange and published proceedings.

Topics of interest include, but are not limited to, the following areas: professional applications, office automation, command and control, exploration, weapon systems, systems engineering, equipment, project management, flexible automation, software, architecture, imagery, education, entertainment and expert advice giving.

Completed papers are to be no longer than 20 pages, including graphics, and must be received by the program chairman by May 1.

Four copies of papers should be sent to Kamal Karna, Program Chairman, Mitre, 1820 Dolley Madison Blvd., McLean, Va. 22102.

Notification of acceptance and instructions for the preparation of manuscripts will be provided by May 20.

THE SIXTH INTERNATIONAL CONFERENCE ON INFORMATION SYSTEMS
Indianapolis, Dec. 16-18

The conference committee is accepting papers for this sixth annual conference. It is particularly interested in submissions concerning enterprise analysis/information systems planning; management of the information resource; methods for assessing the impact and/or effectiveness of information systems; productivity tools and support environments; integration of telecommunications, data base, distributed processing and office automation; development and use of knowledge-based support systems; issues in, approaches to and results of user-developed systems; contributions to and selection criteria of research methodologies; computer-based education and training; and results of long-term, multiperson information systems research programs.

The program chairman must receive completed papers in triplicate no later than May 6.

The papers should not be longer than 25 printed, double-spaced pages, including illustrations, tables and references.

They should be written in English and on one side of the page only, and authors' names should appear only on a separate title page. The program chairman will accept written requests for a more detailed style guide for the format of the submitted paper.

For additional information, contact Jeffrey A. Hoffer, Conference Chairman, Graduate School of Business, Indiana University, 10th and Fee Lane, Bloomington, Ind. 47405.

INTERNATIONAL CONFERENCE ON COMPUTER-AIDED DESIGN (ICCAD - 85)
Santa Clara, Calif., Nov. 11-14

This conference will be oriented toward electrical engineering computer-aided design professionals, concentrating on CAD for integrated circuit design.

Paper topics include, but are not limited to, design and methodologies, CAD systems, interactive graphics, modeling and simulation techniques, design automation, layout and layout verification and testing.

All papers should be suitable for a 25-minute presentation and must not have been previously presented or published. Authors should submit 12 copies of both a one-page summary and a more detailed description of up to 1,000 words in length.

Submissions should clearly identify the following information on the first page: the title of the paper, full author name and affiliation and complete return address and telephone number of the individual to whom all communications should be addressed. Submissions are due by May 10 and should be sent to Ian Getreu; ICCAD-85, P.O. Box 1972, Beaverton, Ore. 97075.

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CALENDAR

WEEK OF APRIL 28

APRIL 28-MAY 1, MARCO ISLAND, FLA. — **Fifth Annual Conference and Symposium on Security and Diaster Recovery Planning.** Contact: Nancy DeMatteo, HSH, Inc., 6800 N. High St., Worthington, Ohio 43085.

APRIL 29-30, DES MOINES, IOWA — **Managing Information Centers Effectively.** Contact: Thomas Bisacquino, Association for Systems Management, 24587 Bagley Road, Cleveland, Ohio 44138.

APRIL 29-30, LOS ANGELES — **Software Configuration Management.** Contact: Data Processing Management Association Educational Foundation Seminars, c/o Technical Training Corp., Department SCM, P.O. Box 3608, Torrance, Calif. 90510.

APRIL 29-30, NEW YORK — **Information Centers.** Contact: Software Institute of America, 8 Windsor St., Andover, Mass. 01810.

APRIL 29-30, SAN FRANCISCO — **CAD/CAM Data Bases: Who's In Control?** Contact: Jacquelin Cooper, CAD/CAM Alert, 824 Boylston St., Chestnut Hill, Mass. 02167.

APRIL 29-MAY 1, DALLAS — **MVS Architecture.** Contact: Acts Corp., 11910 Gate Way, Austin, Texas 78727. Also being held on May 13-15 in Memphis and May 29-31 in New Orleans.

APRIL 29-MAY 1, CHICAGO — **Establishing a Computer Security Program.** Contact: Computer Security Institute, 43 Boston Post Road, Northboro, Mass. 01532.

APRIL 29-MAY 2, WASHINGTON, D.C. — **Experts on Networks.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

APRIL 29-MAY 3, SEATTLE — **Ada Software Engineering Workshop.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402. Also being held May 6-10 in Boston.

APRIL 29-MAY 3, NEW YORK — **CICS Internal Architecture.** Contact: Sysed, Inc., 35 W. 35th St., New York, N.Y. 10001.

APRIL 29-MAY 3, CHICAGO — **MVS JCL.** Contact: Sysed, Inc., 35 W. 35th St., New York, N.Y. 10001.

APRIL 30-MAY 3, TORONTO — **Designing Digital Communication Systems.** Contact: Ruth Dordick, Integrated Computer Systems, P.O. Box 45405, 6305 Arizona Place, Los Angeles, Calif. 90045.

APRIL 30-MAY 3, WASHINGTON, D.C. — **Implementing Local-Area Networks.** Contact: Ruth Dordick, Integrated Computer Systems, P.O. Box 45405, 6305 Arizona Place, Los Angeles, Calif. 90045.

MAY 1-2, LONG BEACH, CALIF. — **Artificial Intelligence and Advanced Computer Technology Conference/Exhibition.** Contact: Tower Conference Management Company, 331 W. Sesley St., Wheaton, Ill. 60187.

MAY 1-3, ROCHESTER, N.Y. — **Unix.** Contact: Center for Advanced Professional Education, Suite 110, 1820 E. Garry St., Santa Ana, Calif. 92705. Also being held May 8-10 in Denver.

MAY 1-3, DENVER — **Lotus 1-2-3 Applications.** Contact: The American Institute for Professional Education, Carnegie Building, 100 Kings Road, Madison, N.J. 07940.

MAY 1-3, ANAHEIM, CALIF. — **Local-Area Networks: An Evaluation of Technology, Applications & Designs.** Contact: Center for Advanced Professional Education, Suite 110, 1820 E. Garry St., Santa Ana, Calif. 92705. Also being held May 8-10 in Cincinnati, May 15-17 in Hartford, Conn., May 20-22 in Denver and May 29-31 in Parsippany, N.J.

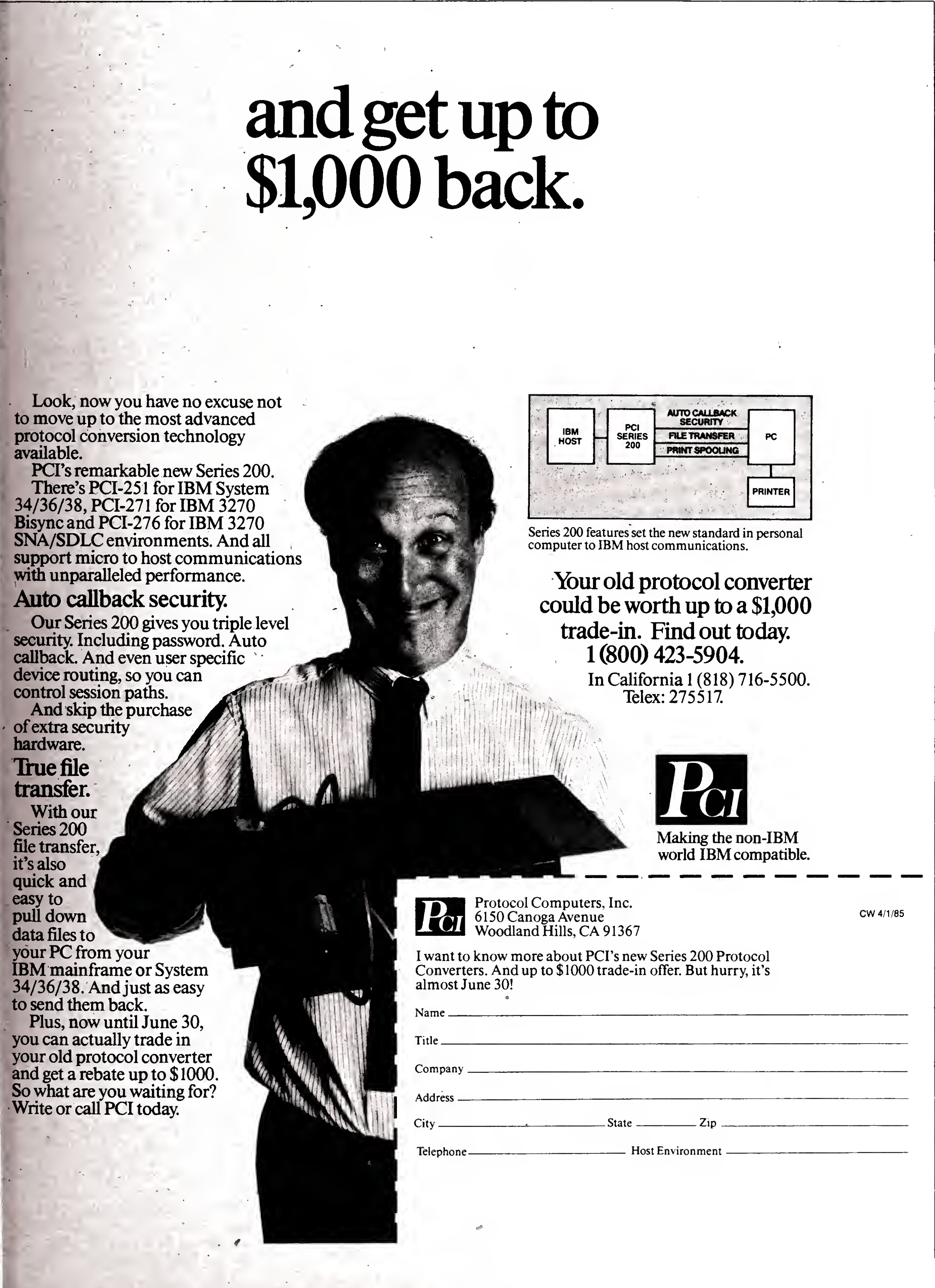
MAY 1-3, SAN FRANCISCO — **Digital PBXs.** Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015.

MAY 1-3, DANVERS, MASS. — **Symposium on Small Systems.** Contact: Fred Maryanski, EECS Department, University of Connecticut, Storrs, Conn. 06268.

MAY 2, CHICAGO — **Building Security Awareness.** Contact: Computer Security Institute, 43 Boston Post Road, Northboro, Mass. 01532.

MAY 2-3, SALT LAKE CITY — **Using Dbase III.** Contact: The American Institute for Professional Educa-

See **MAY** page 40



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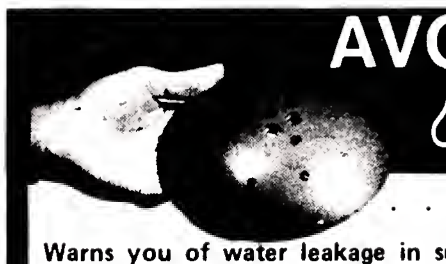

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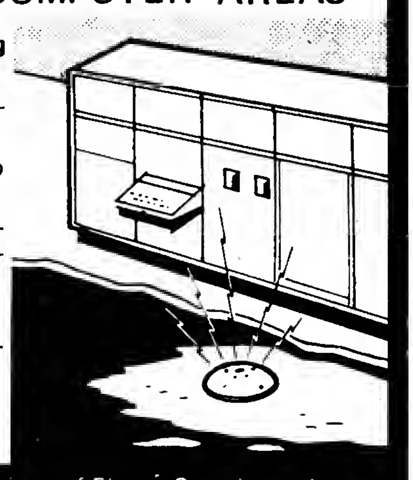

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MAY 2-3, CHICAGO — **Introduction to Communications Security.** Contact: Computer Security Institute, 43 Boston Post Road, Northboro, Mass. 01532.

MAY 3, BELLEVUE, WASH. — **Unix for Managers.** Contact: Kathy Howard, Specialized Systems Consultants, P.O. Box 7, Northgate Station, Seattle, Wash. 98125.

MAY 4-5, NEW YORK — **CICS Command-Level Intensive.** Contact: Sysed, Inc., 35 W. 35th St., New York, N.Y. 10001.

WEEK OF MAY 5

MAY 6, NEW YORK — **CICS/VS Internals.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J..07024. Also being held May 8, 10, 13 and 15 in New York and May 20-24 in San Francisco.

MAY 6-7, LOS ANGELES — **CICS/VS Performance & Tuning.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held May 20-21 in Fort Lee, N.J.

MAY 6-7, WAKEFIELD, MASS. — **Software Rapid Prototyping.** Contact: Data Processing Management Association Educational Foundation Seminars, c/o Technology Training Corp., Dept. SRP, P.O. Box 3608, Torrance, Calif. 90510. Also being held May 9-10 in Orlando, Fla., and May 13-14 in Washington, D.C.

MAY 6-7, WASHINGTON, D.C. — **Software Maintenance.** Contact: Data Processing Management Association Educational Foundation Seminars, c/o Technology Training Corp., Department SMA, P.O. Box 3608, Torrance, Calif. 90505. Also being held on May 9-10 in Boston and May 16-17 in Atlantic City.

MAY 6-7, HOUSTON — **MVS Overview.** Contact: Acts Corp., 11910 Gate Way, Austin, Texas 78727. Also being held June 24-25 in Washington, D.C., and September 9-10 in Austin, Texas.

MAY 6-8, BOSTON — **Relational Data Base.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402. Also being held May 13-15 in Los Angeles.

MAY 6-8, DALLAS — **EDP Software Maintenance.** Contact: Conference Manager, U.S. Professional Development Institute, 1620 Elton Road, Silver Spring, Md. 20903.

MAY 6-8, DALLAS — **Networking Personal Computers.** Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015.

MAY 6-8, SAN FRANCISCO — **Data Communications System Components.** Contact: Systems Technology Forum, 900 Fern Park Drive, Burke, Va. 22015.

MAY 6-9, WASHINGTON, D.C. — **Vtam: From Start to Finish.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held May 13-16 in Denver, May 20-23 in Los Angeles and May 28-31 in Fort Lee, N.J.

MAY 6-10, HOUSTON — **Structured Systems Design Workshop.** Contact: Elise Rabalais, Learmonth & Burchett Management Systems, Inc., Suite 405, 2800 N. Loop W., Houston, Texas 77092. Also being held May 20-24 in Houston.

MAY 6-10, CHICAGO — **The James Martin Seminar.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

MAY 6-10, WASHINGTON, D.C. — **Hands-On Programming in the C Language.** Contact: The George Washington University, Continuing Engineering Education Program, Washington, D.C. 20052.

MAY 8-10, LOS ANGELES — **X.25 and Packet-Switching Networks.** Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015.

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EDITORIAL

The big chill

The computer industry has come down with a sudden case of the chills, brought on by depressed markets and excessive inventories. The result of this unexpected downturn is a disturbing pattern of layoffs, work stoppages and reduced earnings among major manufacturers, leading at least some large users to reconsider or delay equipment purchases.

The list of casualties in the first quarter of this year is long and bloody:

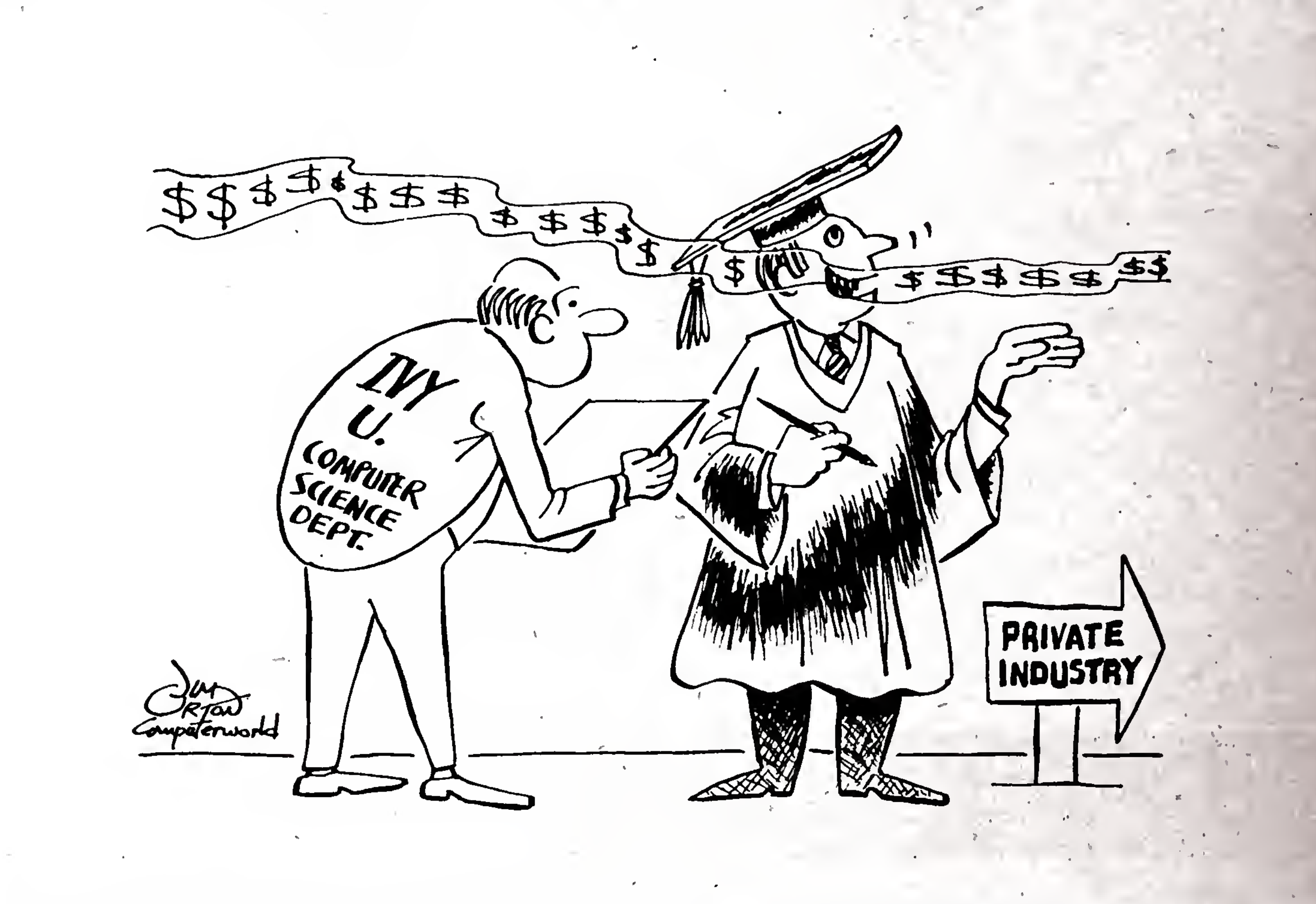
- Wang Laboratories, Inc. admitted it will close all its U.S. manufacturing facilities for two weeks in July, sending 6,000 employees on a mandatory summer vacation [CW, March 25]. Reason: excess inventory.
- Apple Computer, Inc. imposed a staggered one-week halt in manufacturing operations at its Apple II and Macintosh plants during March and April [CW, March 11]. Reason: inventory backlog.
- Texas Instruments, Inc. extended its reduced workweek at its semiconductor plants through midyear [CW, March 4], and specialty chip maker Micron Technology, Inc. said it will fire half its 1,250 employees. National Semiconductor Corp. shut down production for two weeks in February — its first halt since 1981. Reason: softening market demand.
- Intel Corp., which reported hefty increases in revenue and profits for 1984, announced it might not earn any profit for the first three months of 1985 [CW, March 4]. Wang projected its third-quarter earnings will fall 30% to 40% below the same period a year ago. IBM expects first-quarter profits to decline, its first earnings drop since 1981. Datapoint Corp. posted a second-quarter loss and agreed to a liquidation strategy proposed by arbitrageur Asher B. Edelman [CW, March 25]. Convergent Technologies, Inc. discontinued operations for its Workslate laptop computer and disclosed a $14 million loss for 1984. Informatics General Corp. posted depressed profits for 1984 [CW, Dec. 31/Jan. 7].
- IBM killed PCjr. Exxon Corp. quit the office systems market [CW, Feb. 25]. Management Science America, Inc. reached agreement to sell two of its retail microcomputer software subsidiaries [CW, March 4].

Analysts are hedging their bets on the duration of this downturn, but the consensus is that the worst may be over, at least for semiconductor manufacturers. Equipment manufacturers, however, may continue to be plagued during the second quarter and possibly longer by inventory buildup and especially by reduced demand among end users.

The crucial question is this: Does the industry have a chill or a nasty cold? Is this a minor blip in a tremendous growth pattern or does it mean that the economy-leading information processing industry is exhibiting the first signs of a new recessionary cycle?

It may be that the industry, caught up in the frantic practice of one-upping the competition, has simply overwhelmed the users' ability to absorb the flood of new products brought to market in the past couple of years. Users must decide whether the industry has simply tripped over its own feet and needs a few months to correct the imbalance, or if the warning bell is chiming a signal to tone down expenditures and batten down the hatches.

Unfortunately, the latter strategy can only exacerbate the apparent weakness in the U.S. economy that recent indicators have identified.



'I'm happy to stay on teaching here, sir. Hold it! What's that delicious aroma downwind?'

LETTER

'Strictly OA' refuted as Wang credo

It seems that from the article "Overhaul to bolster OAC attendance, interest" [CW, Feb. 25], *Computerworld*'s editors are with the majority of industry editors who insist on keeping Wang Laboratories, Inc. caged in the same old office automation pigeonhole, whereas newcomers in the front-end office market, such as IBM, preen their feathers atop the perch of the fourth estate.

When Wang claimed leadership in OA, we were really talking about integrated information processing — a claim we could rightly make, because no one else was doing it. In fact, Wang became the "office automation computer company" because the press virtually demanded we use the arbitrary definition it had applied to the computer activity occurring outside the traditional MIS environment.

The press, not Wang, chose to equate anything other than DP with the ever-enigmatic term "office automation." Even the systems have been slighted: Numbers are processed on computers; words are processed on processors. I challenge anyone to tell me the real difference between the two, for it seems, "A rose is a rose is a rose," whether you're crunching numbers or letters.

Wang has been pushing integrated information processing since 1979. It has refined the philosophy and the product since then, maintaining that under the integrated information processing umbrella are OA — which is more than word processing — telecommunications and DP. If you're not integrating DP, OA and telecommunications, then you don't have integrated information processing.

Edward Clough
Lowell, Mass.

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VIEWPOINT

Technology offers hope for organ transplants

LECHT ON SCIENCE
Charles P. Lecht

I was revolted when I first heard that doctors had attempted a human heart transplant. If the transplant was a success, I wondered if any of us ever again could feel safe entering a hospital in which human heart transplants were practiced. And when the transplant turned out to be a success, the specter of human sacrifice materialized in the minds of thinking people everywhere; a human heart transplant requires at least one person to die for another to live. I've always considered human heart transplant surgery barbaric, and I believe I am not alone in holding this viewpoint.

It is unfortunate and illogical that recent attempts to perfect the implant of an artificial heart has brought the morality of the surgeons who undertook this operation into question. One doctor whose patient died was forced to defend his decision to use an artificial heart instead of one taken from the chest of a dying person by citing a growing shortage of "qualified donors" and his need for immediate action if his patient was to be saved. He should have been given a medal — as should the doctor who saved William Schroeder's life through the use of an artificial heart. Neither transplant attempts required someone else to die for the operation to begin.

Recent advances in very large-scale integration silicon chips provide every reason to believe that creating working simulations of just about every part of the human body may one day be possible. Today our attentions are focused on the heart, but we must remember that medical and computer scientists together have been making great strides by creating artificial eyes, ears, limbs, arterial systems, kidneys and the like — although progress in this field is not proceeding fast enough. Most inhibiting is the lack of a marketplace as financially promising as business or military systems. Although approximately 25 million Americans (roughly 10% of the population) qualify as "severely disabled," a disproportionate number can't afford the kind of technological devices that may even partially reduce their afflictions. Only a dramatic reduction in the research and development costs needed to create far more effective and cheaper devices can change this situation. Considering the price/performance improvements we've seen in our world of technology, this may occur in our lifetimes.

> *The evolution pattern of devices will give us a model for the creation of systems to support the severely disabled, including devices to replace organs and correct nervous disorders.*

The evolution pattern of devices we've seen thus far in related fields will give us a model for the anticipated creation of systems to support the severely disabled, including devices to replace organs, correct nervous disorders and so on. For example, today's increasingly miniaturized video cameras offer hope for the blind that eye replacement is possible. These cameras — now comfortably carried around in a travel purse and weighing less than 5 lb — required a moving van just 25 years ago. The personal computer I use on board a trans-Pacific airliner weighed as much as 30 tons in the 1950s — consider the Eniac, for example. This same technology can be used to operate a robotic arm, and it is just a matter of time — and I hope not too long — before we can expect to see the cumbersome device that supports the Jarvik 7 artificial heart be made smaller so that both fit into a package no larger than the human heart they replace.

Complexities of technology abound

We cannot help but be impressed by the incredible developments we've seen in large-scale integration, but we cannot underestimate the complexities our scientific community faces in the use of this technology to create artificial parts of the body. The logic and memory complexities of a single human cell are said to far exceed anything we may ever be capable of reproducing in our chip technology. And the information systems networks that our organs depend on to function may offer such an enormous degree of complexity that their reproduction is unobtainable outside the biological world. I assume we believe that this is true — which previously prompted our scientific community to search for organ replacement, especially organs deemed "vital," solely through the transplant of living organisms rather than through the implant of inorganic computer systems technology.

Perhaps we can unlock the mystery of how to grow a living heart, kidney, arm or leg in a laboratory, but the results of employing the discovery may not be as satisfactory as those obtained through the creation of artificial devices like the Jarvik 7. We cannot avoid noticing that, with proper engineering, the meantime between failure of the technology's operation could far exceed anything nature has ever produced. This may revolt some people who fear the possibility of our eventual robotization, but it alone — even carried to the extreme — could never be the cause. We've seen too many human robots emerge in our lifetimes without even a single artificial tooth gracing their mindless bodies.

If we knew how to regenerate our own body parts on demand, of course, the entire issue of how to correct failures in our physical functions would be set to rest once and for all. But until that day, the artificial organ replacements that emerge from a computer systems laboratory are far preferable to the real thing.

Lecht is chairman of Lecht Sciences, Inc., a New York-based think tank specializing in computer and communications technologies.

Unix evolves as a choice, not a standard

WOHL STREET MINIJOURNAL
Amy Wohl

Predictably, the entry of AT&T Information Systems into the information systems market has brought with it a new emphasis on Unix. However, interest in Unix — particularly as a multiuser OS environment for office users and office automation software — was already an important factor in the marketplace.

"Interest" is the key word here, because much of the promised software has never, in fact, materialized. Some software has died aborning; a little has reached the market (notably in bundled systems and in Quadratron Systems, Inc.'s omnipresent Q-One and Q-Office packages), and many packages are seriously overdue but still promised.

What's going on? The following three separate (and intersecting) trends are occurring:

- Much OA software has been (or is being) developed in the Unix environment, largely because of its availability, portability and familiarity.

> *If we are going to have a half-dozen or more versions of Unix extant in the marketplace — each slightly different from the other and each optimized to a particular vendor's hardware — then we will have little or no portability and very little software.*

- Unix's seeming portability makes it an attractive target for software writers, who seek a reasonably large market, and for small hardware vendors, who must depend on third-party vendors for the software they need but can't afford to write themselves.
- Non-IBM hardware vendors (and IBM itself on alternate Thursdays) are pressed to compete with AT&T Information Systems by offering Unix support.

But what does all this sound and fury about Unix portend? Probably less than meets the ear. To dissect the above-delineated trends, consider the following:

- Much less Unix application software has been developed than was anticipated. In fact, about 50 Unix hardware vendors offer Quadratron's Q-One word processing software not because it's good (which it is), but because there's not much competitive product available.
- Unix can only attract and encourage a large body of software if the portability of Unix-based software makes it usable across a broad spectrum of hardware offerings. If we are going to have a half-dozen or more versions of Unix extant in the marketplace — each slightly different from the other and each optimized to a particular vendor's hardware — we will have little or no portability and very little software.

Because it is likely that IBM will embrace the same Unix standard as AT&T Information Systems and the others, it is unlikely that a single Unix standard, strongly defended, will emerge.

- Many commentators have confused IBM's reluctant support of Unix with enthusiastic endorsement. Do not expect IBM to be a strong Unix supporter. Big Blue considers Unix a defensive move, an attempt to ensure that not a single customer — based on his desire to use a Unix environment — moves from IBM's customer set to AT&T's. We expect IBM to continue to be a reluctant handmaiden at the Unix altar: It will surely support

See **UNIX** page 44

Wohl is president of Wohl Associates in Bala-Cynwyd, Pa., and editor of the "The Wohl Report on End-User Computing" newsletter.

VIEWPOINT

LETTERS

Licensing options

The article "Thou shalt not dupe" [CW, Jan. 28] did not address the issue of current licensing restriction and its impact on end-user ability to apply the software to the application for which the user purchased it.

The statement that data processing departments have grown up with license agreements but that users of microcomputer-based software have not and need to be brought in line assumes there is little difference between the two environments.

I am currently concerned with the accessibility of the licensed software. When software is licensed for a mainframe or microcomputer, the accessibility to that software is limited only by the number and locations of the terminals and communications ports connected to the system. Although the software is limited to a single CPU, it is available to a large group of users.

Current software licensing for microcomputers attempts to follow the same practice of limiting the use of the software to a single CPU. But, as a result, the accessibility of that software is also limited, and this is where one of the problems lies.

I am now working on an alternative project that uses three microcomputers to collect data, which will then be forwarded to a fourth for merging and conversion to a standard format. If a licensed software package — such as a data base management system — is used to develop the programs required to collect the data on the central micro, three additional copies of the software package will need to be purchased to allow the developed programs to be used on the other micros. It is difficult to explain to a client why the additional expense is necessary, especially when the software costs $700 a copy.

Limiting the software to one CPU, in a case like this, seems inappropriate. An option in the licensing should provide additional copies to a single purchaser at a considerable discount, such as 10% to 20% off the price of the first copy, with consideration given to volume purchasers.

Kenneth Jegerski
Hickory Hills, Ill.

*Computerworld welcomes letters from its readers. Preference will be given to typed, double-spaced letters of 150 words or fewer. Letters may be edited for the purposes of clarity and brevity. Letters should be addressed to Editor, **Computerworld**, Box 880, 375 Cochituate Road, Framingham, Mass. 01701.*

UNIX

from page 43

Unix, and it will surely continue to promote IBM solutions to customers, encouraging IBM software from third-party vendors.

When the dust clears — which will take far longer than anyone thinks — we should expect the following:

- Unix as a second standard (second to IBM's de facto standards, that is) with most hardware vendors providing support.
- Some Unix OA software, although much OA software will stay outside of the Unix camp because of vendor love for proprietary operating systems, the performance problems for this I/O-hungry application and IBM's failure to set the tone by strongly encouraging Unix software. (The phrase "damning with faint praise" springs to mind.)
- The possibility that IBM will propose another proprietary (at least partially open) operating system to succeed its PC-DOS. This will, of course, become an immediate de facto standard, particularly if it permits current PC-DOS software to run under it.
- Unix as a standard will be blurred if proposals from January's Uniforum conference to create a set of Unix extensions — each optimized to a particular set of applications — should materialize.

In the end, Unix will take its proper place in the marketplace not as *the* standard but as one of a series of choices. It will be useful where its tools offer advantages and passed over where and when newer products (particularly those blessed by IBM and its coattail progeny) enter the market and become accepted. ‡

SCIENCE/SCOPE

After slowing from 107,000 miles per hour to subsonic speeds in just two minutes, NASA's Project Galileo Probe will take the first direct samplings of Jupiter's atmosphere later this decade. During its plunge through the brightly colored clouds, much of the Hughes Aircraft Company probe's forward heat shield will be eroded by temperatures of several thousand degrees. Once the probe has slowed, a mortar in the rear heat shield will fire to deploy a parachute. This parachute will pull off the back cover, releasing in turn the main parachute. Small explosives will release the front heat shield from the descent module. The parachute will slow the descent as the shield continues into the interior of the planet. Data will be transmitted to an orbiting spacecraft for relay to Earth. Project Galileo is set for launch in May 1986 and is scheduled to arrive in August 1988.

An antenna system made entirely of composite materials is operating on LEASAT, a communications satellite launched last year from the space shuttle. The antenna's structural elements and fittings are made of carbon powder, fiber, and epoxy. This approach eliminates metal pieces that cause spurious signals when impinged by many different high-energy radio signals. The carbon powder also improves the conductivity of the outer surface of the antenna and prevents arcing, the harmful build-up and discharge of static electricity. Hughes built the 7.5-ton LEASAT for operation by a subsidiary, Hughes Communications Services, Inc. The Navy leases capacity for all U.S. military services.

A new 5-volt-only, 256-bit nonvolatile random access memory combines the data retention capabilities of an EEPROM with the convenience of a CMOS RAM. The Hughes circuit, designated H13500, is designed for such applications as reconfigurable systems and fault protection without battery back-up. It is organized as 64x4 bits. Both the read and write operations are performed as in a standard CMOS RAM. A single store operation transfers all data in the RAM cells in parallel to the background EEPROM array. The recall operation restores data in parallel to foreground RAM cells.

A new laser that better penetrates battlefield smoke, haze, and dust will let tank gunners determine the range of any target they can see with a thermal imaging system. The laser is the first carbon dioxide laser rangefinder developed in the U.S. for tactical military applications. It determines range based on the few millionths of a second it takes a laser pulse to reach a target and reflect back. During advanced development tests, the rangefinder demonstrated greater performance under obscured battlefield conditions than the solid-state lasers currently used for military rangefinding. Because the laser and the thermal imaging system operate in the same wavelength, they have the same performance characteristics under battlefield conditions and bad weather. The Hughes laser is also harmless to the human eye and can be safely fired during training exercises. A development model has been configured for evaluation in the M1 Abrams main battle tank.

Career growth opportunities exist at Hughes Support Systems for a variety of engineers qualified by degree or extensive work experience. They include systems engineers, radar engineers, and software and hardware design engineers for major simulation and test equipment programs. Also, field engineering posts throughout the U.S. offer travel, autonomy, and responsibility for the life cycle of Hughes electronics systems. Please send your resume to Lowell Anderson, Professional Employment, Dept. S3, Hughes Aircraft Company, P.O. Box 9399, Long Beach, CA 90801-0463. Equal opportunity employer. U.S. citizenship required.

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SOFTLINE/LES GILLIAM

Is the thrill gone for DP achievers?

Many of the data processing professionals with whom I have contact are frustrated with their careers. The challenge of new technology, which was so important in earlier days, has lost its appeal. For some, boredom is prevalent. For others, the pace has quickened, but the same tasks are repeated. Many have no specific goals and believe their careers are flowing in no particular direction — or worse yet, in no direction at all.

Maybe you have been in DP for several years and have begun to wonder if you made a mistake because your professional progress seems to have stalled. Or maybe you are just getting started in computing and are searching for the secrets that will lead to an enjoyable and rewarding career. A

See **BORED** page 51

Gilliam is an independent consultant based in Ponca City, Okla., and a regular contributor to Softline.

SOFTALK
John Gallant
CW Senior Editor

ADL putting AI technology to work

The corridors are narrow, and the painted cinder block offices that house Arthur D. Little, Inc.'s (ADL) Artificial Intelligence Program are cramped, but the significance of the applied research under way there extends far beyond the less-than-palatial accommodations.

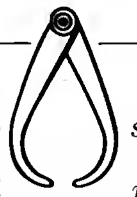
At ADL's Cambridge, Mass., headquarters, AI is leaving the comfortable laboratory environment, which has been its home to date, and going out into the working world. Wearing the many-colored robes of consultants, researchers at ADL's AI program are applying AI to problems of the real world — turning advanced techniques into actual applications for a variety of industrial clients.

Perhaps it would be more accurate to say the AI program is putting AI technologies to work, for

See **AI** page 50

Lowell Jay Arthur

"Count what is countable, measure what is measurable, and what is not measurable, make measurable."
— Galileo Galilei



The desire to measure — to quantify and classify the components of the physical world — is a basic human trait. The ability to measure has fueled past technological advances by shedding new light on the pieces of the puzzle of nature, contended author Lowell Jay Arthur. Thus, it is appropriate that Arthur opens his most recent book, Measuring Programmer Productivity and Software Quality *(John Wiley & Sons, New York), with Galileo's charge to the scientific world.*

Arthur may be described as a proponent and missionary of the cause of programmer productivity and software quality measurement — also known as software metrics. Software metrics is the latest weapon in the continuing battle to improve applications quality and increase productivity. But despite man's obsession with measurement, the principle of software metrics has won few adherents in the software development world. "There are instruments to measure almost every principle and practice in most fields," he wrote, "but not in software development and maintenance. . . . And the only way to ensure high quality and productivity is to measure products as they are produced."

Arthur, who also wrote Programmer Productivity *(John Wiley & Sons, New York), is a programmer productivity analyst for Mountain Bell Telephone Co. in Denver. He discussed software metrics in a recent interview with John Gallant,* Computerworld *Senior Editor/Software.*

Q ***Define the term software metrics.***

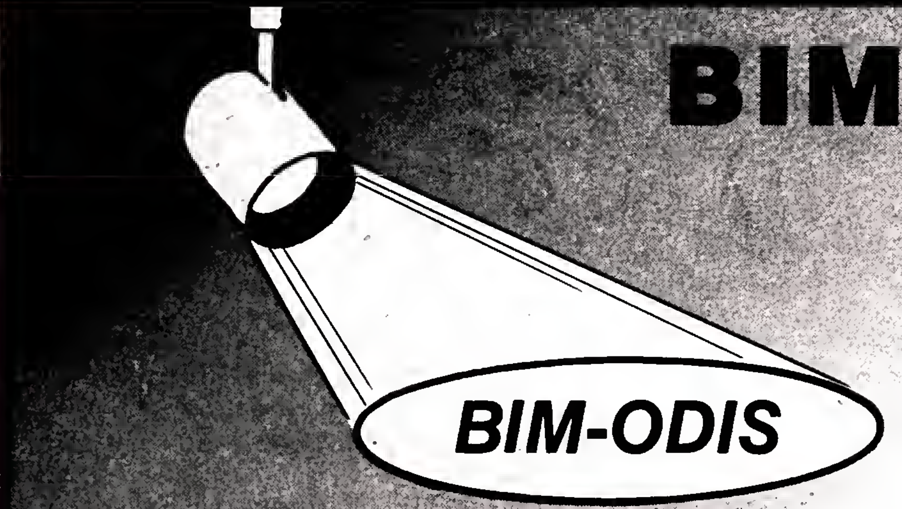
Software metrics is simply the attempt to develop measurement tools to identify quality characteristics in software and to use those measurements, in turn, to develop productivity measurements. It is an attempt to

See **ARTHUR** page 53

■ An IBM mainframe data retrieval tool debuts from Informatics General/**47**

■ Harris gives its superminicomputer line software for computer-assisted engineering, design and manufacturing/**47**

■ Language Processors introduces high-level language compilers/**47**



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PC Magazine *February 19, 1985*

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Computer Buyer's Guide and Handbook
November, 1984

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Personal Computing
March, 1985

"Offering true integration among all of its applications modules...[Enable is] a powerful production tool that can serve everyone in the office, from data entry personnel to the vice-president of marketing. Each module could stand as a full-powered application in its own right."

PC Magazine
February 19, 1985

"Enable, a five-function integrated system from The Software Group, merits a close look by any individual or organization interested in a solid package that is well balanced in all of its applications."

Popular Computing
March, 1985, Paul Goldner, Raymond Hood, Yoram Lirtzman, Michael Wilding

"Quite simply, this package has so many outstanding attributes that even the worst skeptics of integrated software have to be impressed. The spreadsheet is very close to 1-2-3; the word processor combines the best thinking of WordStar, MultiMate, Volkswriter, and EasyWriter; the data base offers the functionality of dBASE II, but with many of the ease-of-use features of PowerBase; and the program offers business graphics and telecommunication. Taken as a whole, Enable surpasses the functionality of Symphony, Framework, Aura and Open Access."

IBM PC Update
December, 1984

Enable first in "Performance" rating—including speed and capacity of all modules tested. Enable first in "Versatility" rating—including power and functionality of all modules tested. Enable rated first in overall evaluation of the word processor module.

Software Digest Ratings Newsletter
Rating of 15 Integrated Products
December, 1984

"Enable welds its five applications together with outstanding integrity—yet each is exceptionally full-functioned in its own right."

Business Computer Systems
January, 1985

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Infoworld
January 21, 1985

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February, 1985

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Harris offers CAD software package for supermini line

FORT LAUDERDALE, Fla. — Harris Corp. has announced a design, drafting, engineering and manufacturing software system called Harriscad that runs on Harris superminicomputers ranging from the Harris 60 to the Harris 1000.

According to a vendor spokesman, Harriscad enables users of computer-aided design and manufacturing systems to go from design concept, drafting and analysis to manufacturing on one system. Harriscad resides on a common system data base included with the package and provides functions that include numerical control and data base management.

A menu-driven package, Harriscad features separate software modules that handle various mechanical engineering tasks. All modules are linked by the common data base and feature interfaces to complementary software packages.

Harriscad modules include a drafting system, a three-dimensional design system, a manufacturing system, a specialized applications system for modeling and analysis and an integrated design, drafting and manufacturing system. Harriscad can interface with two other software packages: PDA Engineering, Inc.'s Patran and Swanson Analysis Systems, Inc.'s Ansys. Patran is a solid- modeling and finite-element preprocessing and postprocessing program. Ansys is a finite-element analysis program for stress, thermal, dynamic and dynamic response analysis.

The price for Harriscad ranges from $56,250 for a full Harriscad system, including drafting, design/drafting and drafting/numerical control modules on a Harris 60, to $120,000 for those modules on a Harris 1000. The Harris superminicomputers run the company's Virtual Operating System.

Harris' Computer Systems Division is located at 2101 W. Cypress Creek Road, Fort Lauderdale, Fla. 33309.

LPI announces compiler line

WALTHAM, Mass. — Language Processors, Inc. (LPI) has announced a family of high-level compilers for Cobol, RPG-II, Pascal, C, PL/I and Basic aimed at systems utilizing the Motorola, Inc. MC68000 microprocessor and AT&T's Unix.

A company spokesman said the line embraces LPI's Component Architecture, a modular design combining a front end, an optimizer, a code generator, a runtime library and a high-level debugger. The compilers use the same access method to handle data files, so programs written in one language can address and use files written in another. The architecture also allows single programs to be written in more than one language, a feature supported by the LPI-Debug multilanguage debugger.

LPI-Cobol meets the Ansi 1974 high-intermediate standard, with extensions to allow users to transport programs written for IBM 370 series CPUs using Cobol-68. LPI-RPG-II is compatible with System/34 minicomputers, so that users can transport RPG-II programs to their MC68000-based system.

LPI-Pascal implements IEEE/Ansi standard Pascal, with extensions designed to speed program development.

Each LPI compiler module is priced at $50,000.

LPI is located at 400-1 Totten Pond Road, Waltham, Mass. 02154.

On-line retrieval tool for IBM data bases out from Informatics

WOODLAND HILLS, Calif. — Informatics General Corp. has announced Answer/DB-Inquiry for on-line data retrieval from any IBM mainframe data base.

According to a spokesman, Answer/DB-Inquiry provides mainframe terminal users with access to production IBM Vsam data sets and IBM IMS/DB or DL/1 data bases through CICS/VS and IMS/DC under OS/VS or DOS/VSE.

Answer/DB-Inquiry allows users to retrieve information with English-syntax queries. Up to 10 data base files can be opened and viewed at the same time, including any combination of DL/1 and Vsam files.

Answer/DB-Inquiry reportedly processes user-defined requests and output statements and displays requested data on the screen or routes it to a printer. Data base security against unauthorized access is provided through user profiles, the vendor said.

Answer/DB-Inquiry costs $20,000 for the OS/VS-compatible package and $15,000 for the DOS/VSE package.

More information on Answer/DB-Inquiry is available from Informatics, which is located at 2103 Ventura Blvd., Woodland Hills, Calif. 91364.

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In fact, the STEAMER compression routine is so efficient, it virtually guarantees no additional delay added to response time. Our compression algorithm can compress or decompress 3,000 characters per second. That's the equivalent of a 14,400 BPS circuit operating at an 83% saturation rate in both directions simultaneously!

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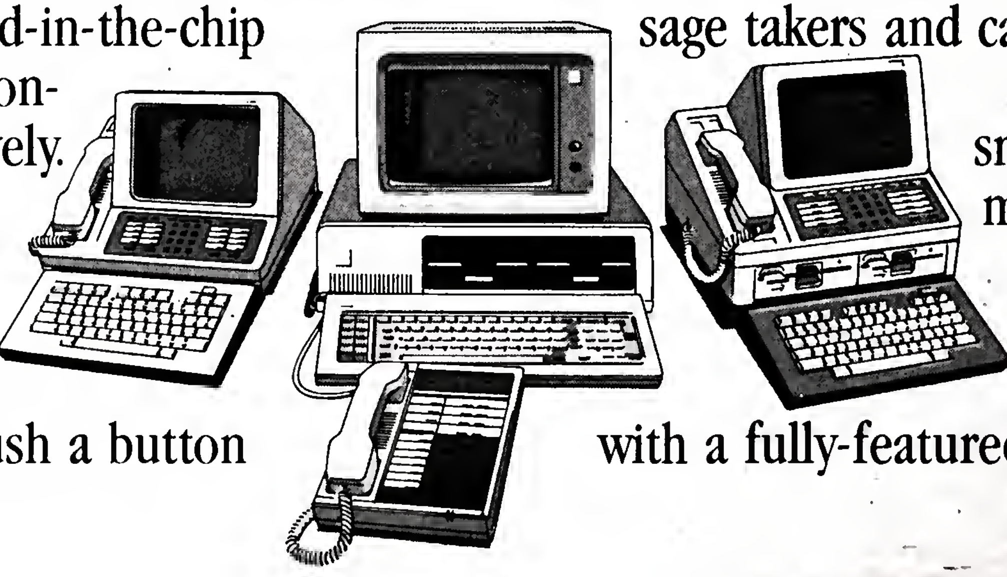

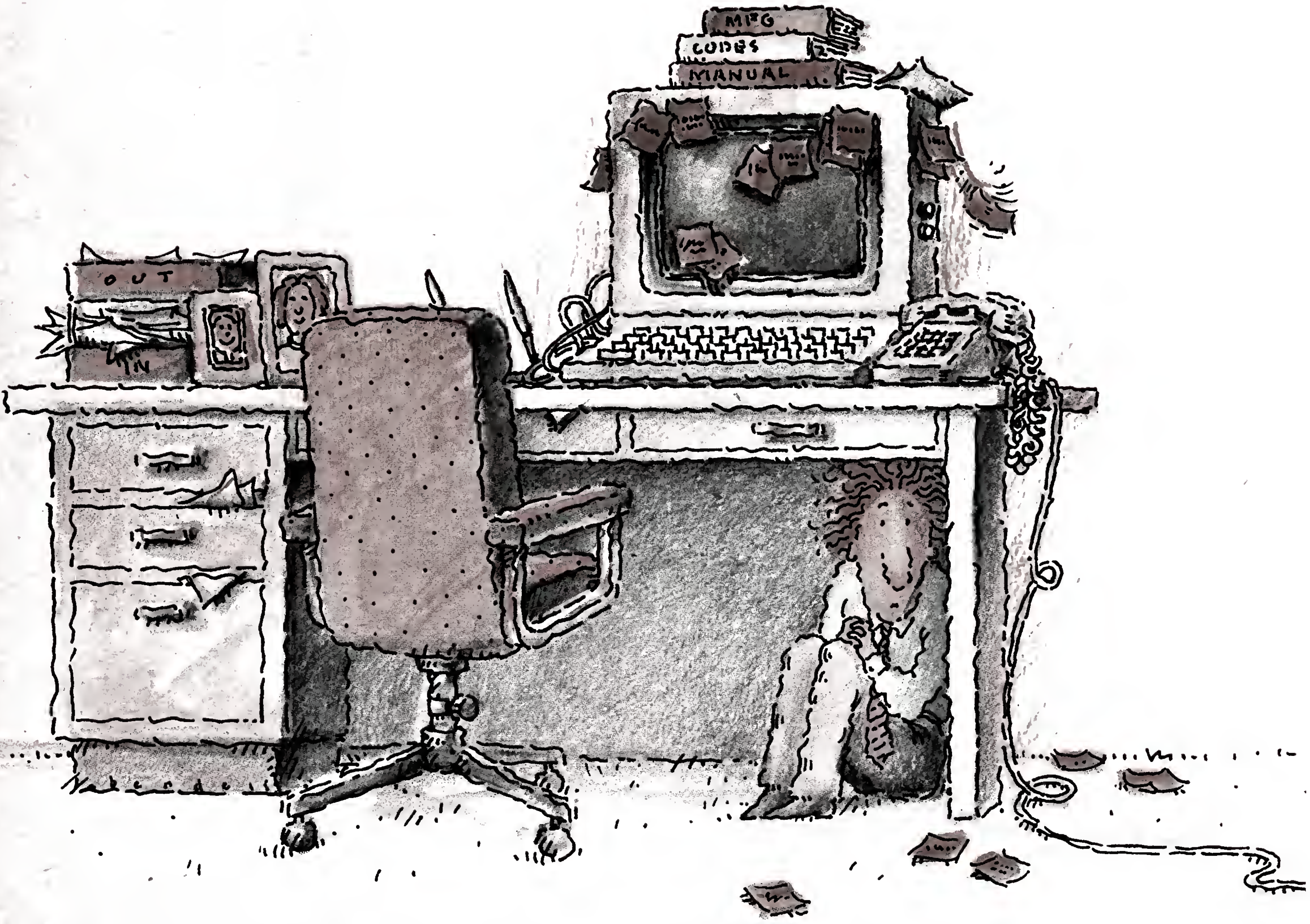

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AI from page 45

even the program's director, Karl Wiig, is hard-pressed to define the amorphous term artificial intelligence.

"I do not know what AI is," Wiig acknowledged during a recent interview. "But I think we do know what the AI technologies are. They are the products and techniques that fall out of the horn of plenty of AI research. If you ask what AI itself is and is not, you get into a semantics debate that leads nowhere. We think, rather, about the use of AI technology for applications, and we try to make those applications as knowledgeable and intelligent as possible."

Applications key

The significance of ADL's AI undertakings can be summed up in that one word — applications. Many people, especially those in the traditional information systems world, have sharply criticized AI researchers for dwelling too long on the leading edge, for not handing the fruits of their labors down from their lofty academic sphere.

But some AI researchers contend the traditional DP shop is not yet an appropriate environment for budding AI technologies. They reason that current hardware and software architectures are not designed, and were not intended, to support the radically different processing and programming requirements of technologies such as expert systems and natural language interfaces.

Others state that until AI-dedicated tools such as Lisp machines become affordable to a wider corporate audience, and until mainstream manufacturers like IBM begin to offer AI-related support tools such as Lisp compilers for their processors, AI cannot hope to gain a toehold in the information systems world.

There is also a small minority of AI aficionados who question whether AI technologies can, or should, ever meld with DP. Whether from academic hubris or just plain disdain for traditional information systems, that minority would have AI remain untainted by DP. "There are a number of AI people," Wiig stated, "who do not recognize that DP has anything at all to offer."

Weakening possible

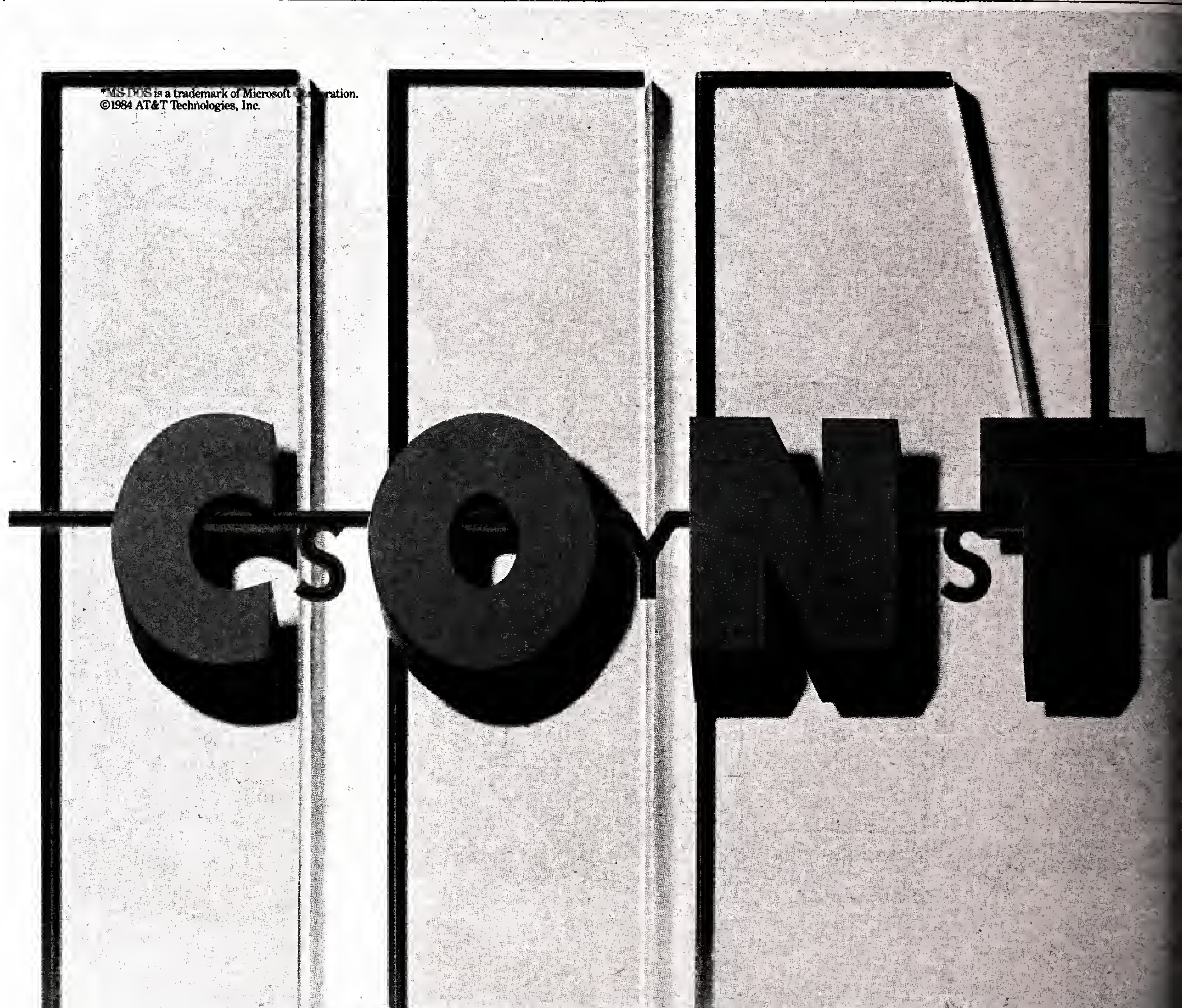
Thus, it is remarkable that ADL's AI program has been so successful to date in merging AI and conventional information/knowledge processing technology. In certain cases, Wiig and his colleagues admit, that blending can result in some weakening of an AI application transported to a DP environment.

For example, an expert system developed in Lisp on a Lisp machine and cross-compiled to C or PL/I to run on a mainframe loses much of its flexibility to change and adapt to new knowledge. Knowledge maintenance, so to speak, must be undertaken in the Lisp environment and the system once again must be ported to the conventional language. The application also becomes opaque, AI researchers claim, making it difficult for users to discern just how the system reached the conclusion it did. When it comes to expert systems, that reasoning process is every bit as important as the answers the system generates.

Arthur D. Little, Inc.

While that degradation is a concern to AI program staff members, they remain cognizant of the massive investment U.S. industries have made in the current generation of information systems. Wiig said that, with ADL's help, clients have been successful in developing AI applications that either make use of existing systems or provide a functional or financial return high enough to warrant investment in dedicated AI hardware and software. The trick, they say, is not to become enamored of the technology but to carefully explore where it can be applied to improve operations.

That is a message that other AI researchers, at least those who would like to embrace the corporate audience, and AI product vendors would do well to heed. With this idea in mind, they could perhaps win a greater constituency within DP and spur interest in, and acceptance of, AI technologies. Skirting the information systems world can only spawn conflict and slow the adoption of the powerful, if still formative, AI technologies.



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BORED

from page 45

fresh look at the key factors of success in DP may be just what you need.

Your definition of success and your goals will probably change many times throughout your career. As you achieve one level of success, you must set new goals so you may reach your full potential. If you do not have a goal to shoot for, how will you know when you hit it?

There is a difference between education and training. Formal education is required if you are to have a reasonable chance of attaining your goals. For example, someone in computer operations who wants to go into programming may have limited success without a college degree. A māster's degree in computer science usually prepares a person for greater responsibilities than does a bachelor's degree. If you have set your sights on a position in management, a master's degree in business administration may be valuable.

But formal education is only part of the preparation for a career. You should strive to keep your skills and knowledge base up to date throughout your career by undergoing training — and opportunities for that training abound in our industry. Your education will set the framework for your career, but the application of trained skills will move you up within that framework.

We need to be honest with ourselves about our natural talents and abilities. Attempting to accomplish outstanding feats in any field for which we are not skilled is frustrating, unenjoyable and unsuccessful.

The difference between a positive attitude of support and contribution and a negative, fault-finding and complaining attitude can be counted in the money earned over the many years of a career. A negative attitude repels, but a positive attitude acts as a magnet, drawing to itself the strength of those who want to help you succeed.

Successful people have an intense desire to excel. That desire is called drive, which is both a physical and mental condition. Withstanding the pace and pressure of a career in information systems requires much energy and stamina. Good eating habits and regular exercise pay rich dividends in providing some with the strength to perform when others lag. That extra measure of energy and desire could be your ace in the hole — the difference between you and your competitors.

Success in any field requires an above-average investment of time, and DP is no exception. The number of hours you devote to your career each week is a key factor in determining your advancement. Employers look for people willing to give that extra time. Be careful not to work beyond a sensible level, though; that can lead to physical or mental fatigue, which hampers your effectiveness.

> ”
>
> *Education will set the framework for your career, but the application of trained skills will move you up within that framework.*

Usually, those who advance in an organization view their responsibilities as more of an owner than an employee. That is, they become personally concerned with the success of the business. They continue to look for ways to make the business more successful, whether or not it benefits them directly. Commitment separates the successful from the unsuccessful.

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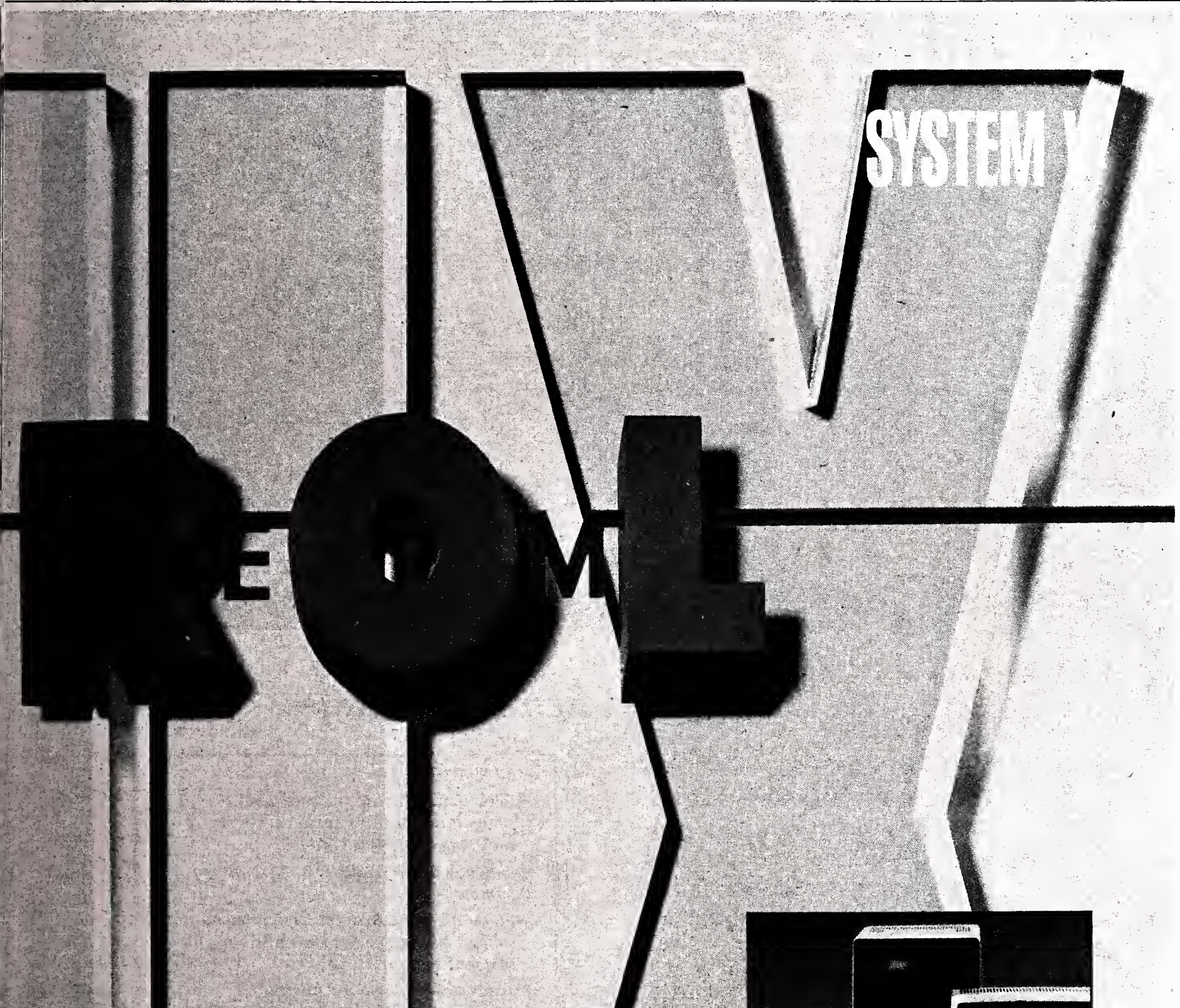

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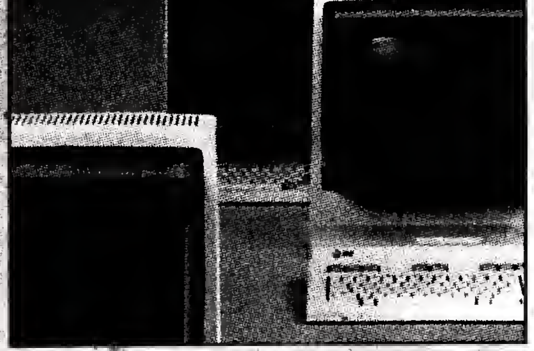

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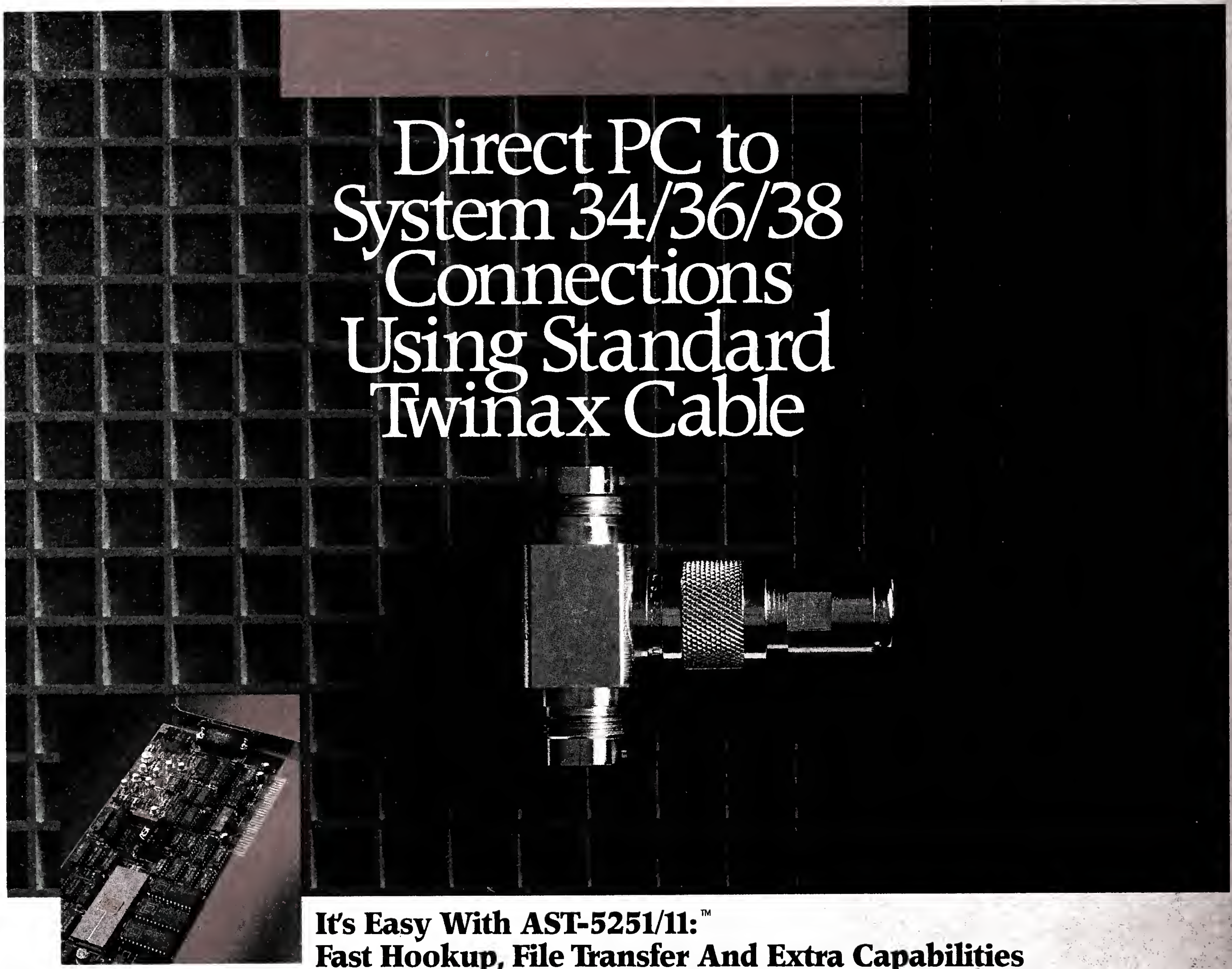

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ARTHUR

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quantify the quality of whatever is being produced rather than going through laborious manual processes, like inspections and walk-throughs.

Q ***You state that measurement often carries a negative connotation. Does the use of metrics sometimes cause resentment or a backlash on the part of those being measured?***

You have to remember that most people have not been measured in the past. Consequently, they want to be certain they are being measured on a reasonable scale. People have to get used to the units of measure and, in their own experience, validate those measures. The general public right now accepts pounds and kilograms, but people have problems when you mention, say, lines of code or some other measure. They have heard that lines of code do not always work, so they try to discredit the measurement because they aren't ready to be measured yet.

Q ***How can that be overcome?*** Basically, it takes some management skill. You have to convey the message that metrics is a tool that you want people to consider as a professional improvement in their jobs; a way for them to improve the quality of their code and become better from a systems analyst or programmer standpoint.

Q ***What are the primary yardsticks or measures used in software metrics?***

They fall into two basic classes: size and complexity. From a size standpoint, executable lines of code — all the verbs in a given module — is one fairly good metric of size. As programs get larger and larger, with more than 200 to 300 executable lines of code, they become very multifunctional. There are all kinds of bad things that can occur in such large systems.

Most of the complexity measurements have evolved around decisions. Decisions are the things that send you down one path or another, and at every branch in the process you add a little complexity. Decisions are statements such as IF-THEN-ELSE, DO-WHILE or DO-UNTIL.

Q ***Once a development group begins using metrics, how long is it before improvements in program reliability or reduced maintenance become noticeable?***

That is a function of finding a champion within a group who is willing to look at and use the tools. Once you get a champion, the champion then sells it within the work group to everyone else. That champion is the person who is willing to do a rigorous job of building a new system or taking an old program and doing preventive maintenance on it, taking out as much size and complexity as possible.

Q ***Given mankind's obsession with statistics, why has the use of metrics not really caught on?***

Predominantly, because it has resided mainly in the laboratory environment. It has been done in big shops where you can collect all the necessary data and statistics to show that something is a valid metric. The research findings get published in things like the *IBM Systems Journal*, which not all people read. The other side of the coin is that management, for a long time, has not been concerned with quality; it has been concerned with getting a product out the door at a certain date. As long as there is a lack of concern about quality, there is no reason to invest in building these tools to aid and abet the programming task.

Q ***Does it require special training in metrics or certain management skills to implement metrics successfully?***

It requires a lot of human factors skills. The society you are going into is not used to being measured. So, in general, it is going to see that as a threat. You have to also be a pretty good technician to get all the necessary information from the various sources and put it into a program that will do these measurements automatically.

Q ***Because some of the benefits may be further down the road, does that make it difficult to sell the metrics concept to management?***

If you are sneaky, you sell it as a means of measuring productivity. Or if management is really hot on quality, you sell it as a means to measure that. If you start measuring, collecting this information and tying it into people hours, total dollar costs, total computer usage — creating some productivity statistics — management will buy off on it.

Q ***What are some common problems software organizations encounter when they first apply metrics?***

The most common [problem] is that when you put in a tool like metrics,

See **ARTHUR** page 54

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ARTHUR

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people expect it to be perfect. But measurement is an inexact science. Your measuring tool is only as good as the current state of the art. People want exact tools, and this is not yet an exact science.

Q ***Is the focus of metrics primarily on improved quality or increased productivity?***

It is on quality. If you can identify your quality problems and fix them, you are going to get significant productivity increases. The more quality problems you fix, the better off you will be. There is a cadre of programming gurus who have agreed that certain [commands] like GOTO cause problems later in maintenance. If GOTOs are causing 10% of your program logic problems, and you get rid of them, you will recover the costs of downtime and repair.

Q ***Will burgeoning maintenance costs eventually force management in most organizations to adopt the use of metrics?***

I believe so.

Q ***Are the results of software measurement useful in helping DP managers explain the problems of quality and maintenance to senior management?***

Absolutely. The DP manager will complain that he has to devote three or four people a month to maintaining one program. That is ridiculous. But the manager can never get the commitment from upper management to go in and do something about it. Management says, "Just keep it running; keep it alive."

With metrics, you can develop numbers and measures that quantify what is wrong with the program and explain to management that you are going to take out this or that or make it more modular. At the end, you can show that you succeeded in those goals and that now, say, only two people have to maintain the program. Management will see the gains and will begin to invest more in quality. Metrics can be a tool to quantify what is wrong and to show that you are succeeding at repairing it.

Q ***Are there currently adequate tools available in the marketplace to support the use of metrics, particularly the automation of it?***

There are no metrics programs available to my knowledge. Most things today are experimental measurement tools built by larger organizations trying to get a handle on these things. I don't think anything has matured into being a product, but they are fairly easy to build in your own environment.

Q ***Does adherence to metrics and strict quality measurement take the art and creativity out of programming?***

Not really. You discover that the super programmers — those who turn out the modular, maintainable, structured systems — have learned what the best programming style is. They are extremely creative people because they have found the best way to do something. Metrics allows you to identify what the super programmers do and translate that into training to bring other programmers quickly up to that level.

Q ***Are there any software development environments to which the use of metrics is not applicable?***

Not that I know of.

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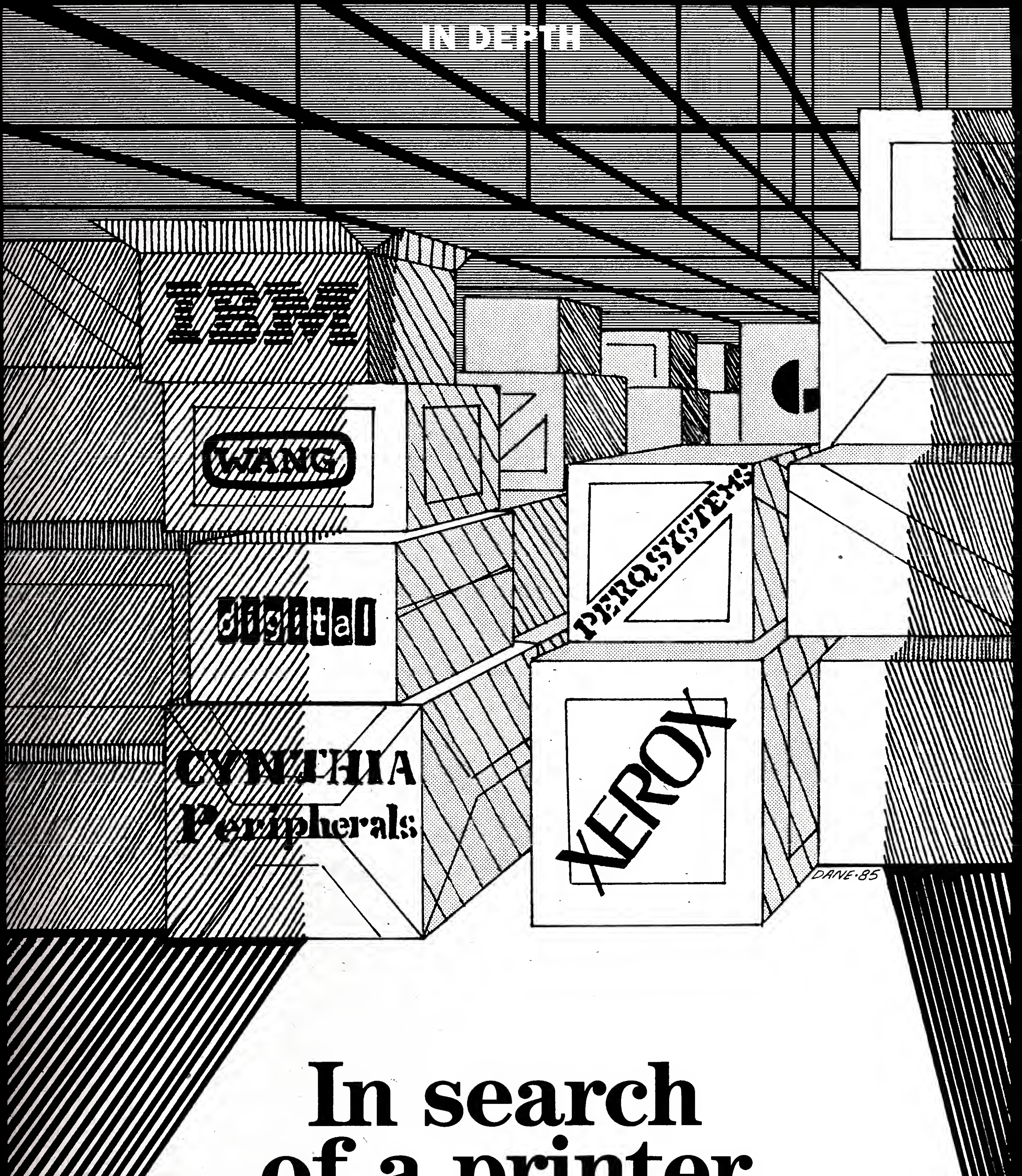


ILLUSTRATION BY HENRY DANE

In search of a printer

By Vincent Cavo

Now is a difficult time to shop for electronic page printers. The low end of this market is just evolving as a result of the recent introduction of low-cost print engines. As often occurs, the software to support new products lags somewhat behind. Consequently, some printer features or operational environments may not be supported initially, and there may be no standards.

The American National Standards Institute is now trying to establish some form of standardization for the laser printer industry. Eventually, this effort should simplify the selection of printers.

The best way for a user to survey the market is to proceed as follows:

- Develop an understanding of the equipment.
- Identify equipment sources.
- Establish a basis for comparison.
- Collect equipment specifications.
- Identify user requirements.
- Correlate user requirements and equipment capabilities.

In at least one instance I know of, the organization failed to examine the requirements of its users thoroughly enough. As a result, it had to get a second printer simply because the first did not support a particular character font. Buying the second printer (after three months of attempts to tailor the first one) proved more cost-effective than investing additional resources in upgrading the first.

In my search for a nonimpact printer that could be used as a peripheral, I considered primarily laser printers but also magnetic, ion and LED types. Each is built around a core that is essentially a paper photocopier engine.

The significant difference among these printers is the technique used to charge the surface of the photocopier's drum or belt prior to the application of toner or ink. Two common types of lasers used in the laser printers are gas (for example, helium-neon) and semiconductor diode. The latter type of laser is also utilized in fiber-optic communications.

Generally, each type of printer makes use of the electrostatic printing process, which in turn relies on the xerographic or dry-copy technique. In this process, fine particles of toner are deposited onto a metallic surface. The segments covered by the charged particles form an image of letters, numbers, lines or graphics. The images are bound to paper by a combination of heat and pressure as the paper comes into contact with the electrostatically sensitive drum or belt.

Laser printers have been commercially available for about 10 years. However, their cost prevented widespread use. Typically, high-end laser printers capable of printing 60 to 100 page/min. commanded price tags of several hundreds of thousands of dollars. Their speed, 10,000 to 20,000 line/min as compared with the few thousand lines per minute for conventional mechanical printers, makes them cost-effective in some applications and hence justifies their high price (for example, in the insurance industry). Recent technological advancements and new designs significantly reduce costs to the point where low-end laser printers, capable of printing five to 20 page/min, can be purchased for from $3,000 to $10,000.

Magnetic, ion and LED printers are recent entries into the marketplace and represent alternatives to the technique used to charge the printer's drum surface. Product offerings are limited, though, and their cost currently exceeds the cost of comparable laser-based printers. The proclaimed advantages are increased reliability and lower maintenance costs, primarily because of considerably fewer moving parts.

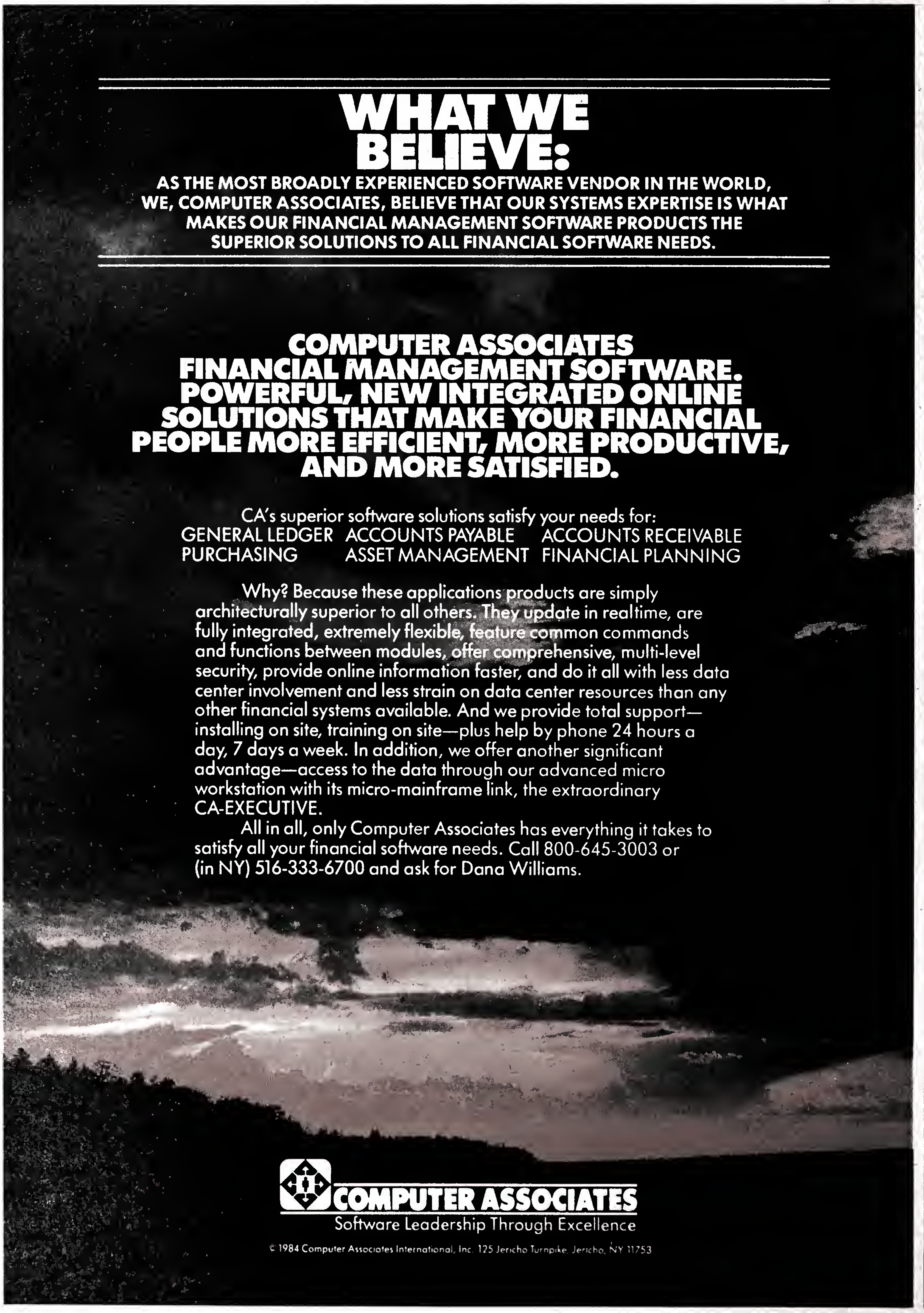
The dumb photocopier printer, lacking a local processor, relies on the host computer to fulfill any processing requirements the printer might have, such as the rasterization of output data. These printers rely heavily on the host computer and require more interaction with the host than do the intelligent printers.

On the other hand, intelligent photocopier printers have both a local processor and considerably more local memory (random-access memory, read-only memory, bit map, floppy disk and so on). The amount of local memory required depends upon whether or not a brute force approach is utilized, one bit for every dot or approximately 1.2M bytes for an 8½- by 11-in. page, or the utilization of sophisticated compression algorithms that may require only 20K to 30K bytes per page. Necessary processing is off-loaded from the host with the concomitant increase in throughput and/or capability and a resultant reduction in the host-printer interaction.

With both types of printers, host preprocessing will be required to support certain printer features or capabilities, such as graphics or the intermixing of text and graphics. This preprocessing is generally performed by special-purpose software resident on the host that must be acquired in order to use certain printer features. Often, the cost of this host-resident software may equal or exceed the cost of the printer itself.

How it works

Before the electrically sensitive unit is charged to represent the print images sent to the printer, the data must be converted to a raster form. Basically, this process involves the decomposition of all print elements into an



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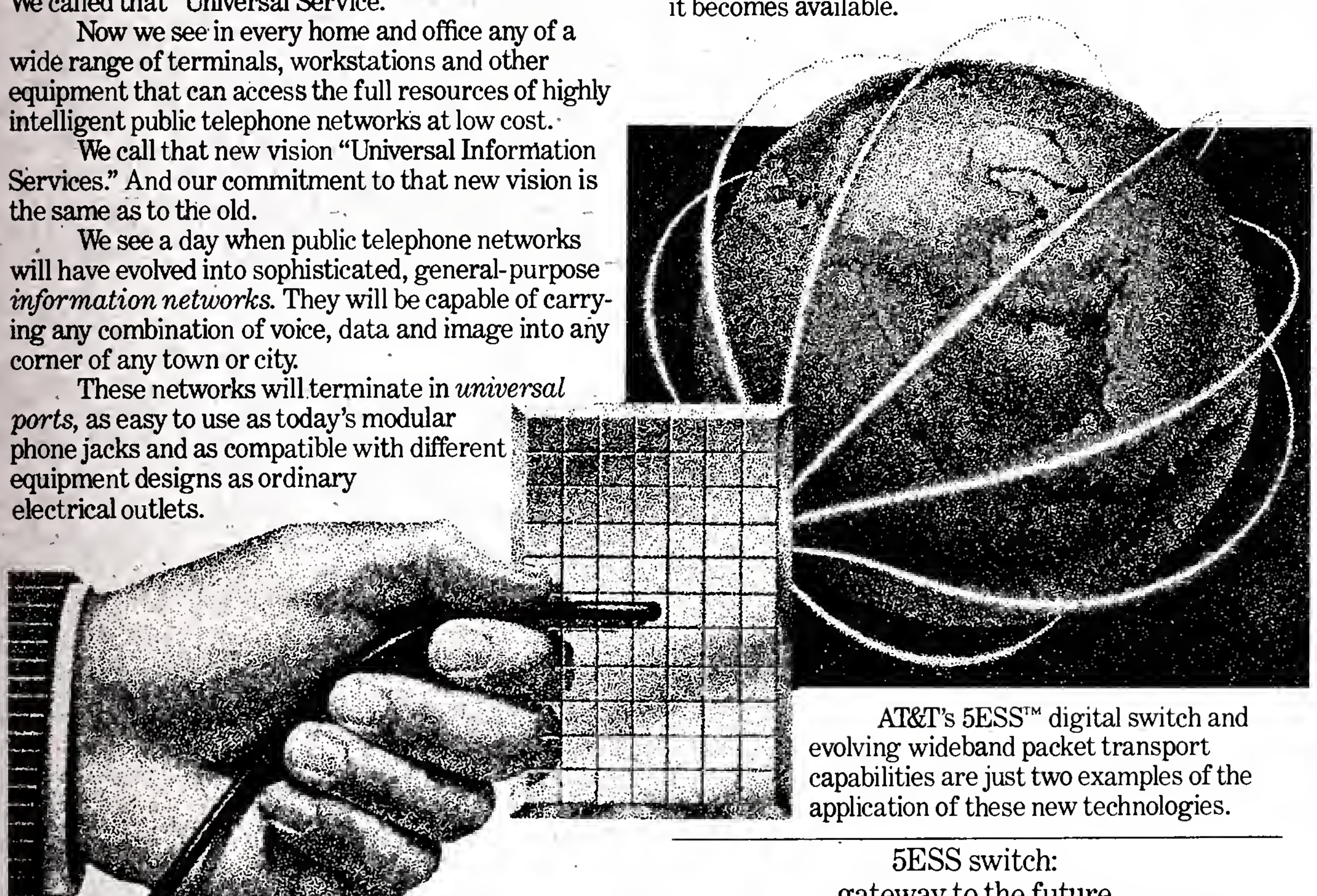

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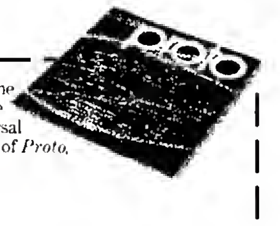

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ordered sequence of dots. A dot represents the basic unit or building block used in the construction of the print images by the printer-charging mechanism. This is analogous to a pixel in graphics, and often the two terms are interchanged.

The quality of the final image depends upon the size of the dot produced by the charging mechanism. For example, a typical photocopier printer today can generate 300 dot/in. with each dot occupying approximately 0.003 in. In comparison, the resolution or dot size for dot matrix printers ranges from 0.02 in. to .007 in. Printers are currently available in the marketplace, such as the Canon printer, which can achieve dot sizes of 0.002 in. Resolution of 700 to 800 dot/in. is needed to be considered typesetting quality. Currently under way are attempts to achieve typesetting quality.

Internally, each dot is represented by a single bit or binary digit that is independent of the dot size. Hence, once an image is rasterized, the quality of the final output depends on the printer dot resolution or dot/in. Conceptually, the rasterized image can be used as readily on a 300 dot/in. printer as on a 700 dot/in. printer, although the quality of the end product will be significantly different.

The charging mechanism imparts a charge by switching the beam off and on for all dots on line number one during a left to right scan parallel to the drum axis. Lines two through six are done in a similar manner and in sequential order. The image becomes obvious once the entire dot pattern is laid down.

For example, in a laser printer, the laser beam scans across the length, generally the drum axis of rotation, of the cylindrical printer drum imparting the necessary charges. The drum then advances forward by a given increment (for example, the dot resolution), and the entire drum length is again scanned and the proper charges applied.

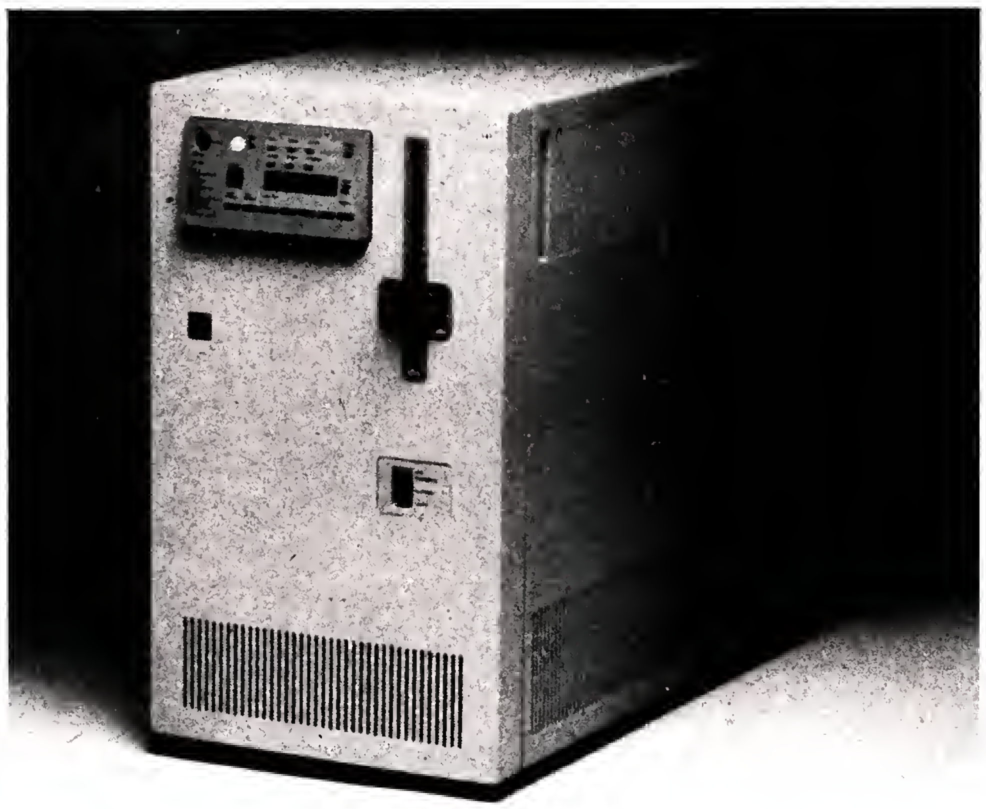
This process of advancing the drum by a given increment and scanning the drum length is repeated until the entire drum is charged or the latent image generated. The charged areas attract the toner, which is then transferred to paper in a manner similar to a standard photocopier, revealing the latent image. The process is extremely rapid, being accomplished in approximately 1 to 2 msec on the low end and 100 microsec on the high end.

In a laser printer, scanning of the drum surface is accomplished by reflecting the laser beam off of a rotating polygonal set of mirrors. Each face of the rotating mirrors causes the laser beam to scan the entire drum length. The scans per second is equal to the number of mirror faces times the number of revolutions per second of the rotating mirrors. An LED printer accomplishes the scanning process by electrically switching the current to a stationary linear

Vendor	Representative product(s)	Approximate price	Page/ min
Concept Technologies, Inc. P.O. Box 5277 Portland, Ore. 97208	Concept Laser 8 (L)	$ 7,995	8
Corona Data Systems, Inc. 275 E. Hillcrest Drive Thousand Oaks, Calif. 91360	Corona Laser Printer (L)	$ 3,395	8
CPT Corp. 8100 Mitchell Road, Box 295 Minneapolis, Minn. 55440	Page Printer 1 (L)	$13,500	13
Cynthia Peripherals Corp. 766 Sanaleso Ave. Sunnyvale, Calif. 94086	Model MP6090 (M)	$50,000	90
Datapoint Corp. 9725 Datapoint Drive San Antonio, Texas 78284	Model 9660 (L)	$47,500	20
Dataproducts Corp. 6200 Canoga, P.O. Box 746 Woodland Hills, Calif. 91365	Model NP24 (L)	$12,495	24
Digital Equipment Corp. 146 Main St. Maynard, Mass. 01754	Model LN01 (L) Model LN03 (L)	$19,995 $ 4,195	12 8
Delphax Systems 977 Pantera Drive Mississauga, Ont. Canada L4W2W6	Model S6000 (I)	$35,000	60
Ferix Corp. 48571 Milmont Drive Fremont, Calif. 94538	Model 800 (M)	$ 3,000	14
General Business Technology 1891 McGaw Ave Irvine, Calif. 92714	Model 6600XP (L) Model 6620XP (L) Model 6630XP (L)	$22,500 $15,600 $ 5,995	12 12 8
General Optronics 3005 Hadley Road Edison, N.J. 07080	Holoscan 28 (L)	$12,500	28
Hewlett-Packard Co. 3000 Hanover St. Palo Alto, Calif. 94304 or 11000 Wolfe Rd. Cupertino, Calif. 95014	Model 2687 (L) Model 2688A (L) Model 2686 (L)	$12,800 $25,950 $ 3,495	12 12 8
Imagen 2660 Marine Way Mountain View, Calif. 94043	Imprint-10 (L) Model 8/300 (L) Model 5/480 (L)	$17,500 $ 9,950 $19,950	10 8 5
IBM Information Systems Group 900 King St. Rye Brook, N.Y. 95193	Model 3820 (L)	$29,900	20
KEL, Inc. 400 W. Cummings Park Woburn, Mass. 01001	Model 5211 (L)	$22,900	20
Perq Systems Corp. 2600 Liberty Ave., Box 2600 Pittsburgh, Pa. 15230	PLP 10 (L)	$15,000	10
Quality Micro Systems 1 Magnum Pass Mobile, Ala. 36618	Lasergrafix 800 (L) Lasergrafix 1200 (L) Lasergrafix 2400 (L) Smart Writer (L)	$ 9,995 $24,995 $35,000 $ 5,000	8 12 24 8
Royal Business Machines 500 Day Hill Road Windsor, Conn. 06095	Royal 2800 (L) Royal 8800 (I)	$19,500 $73,750	20 60
Symbolics, Inc. 261 Vassar St. Cambridge, Mass. 02139	LGP-1(L)	$22,455	12
Talaris Systems, Inc. 7840 Herschel Ave. P.O. Box 8309 La Jolla, Calif. 92038	Model 800 (L) Model 1200 (L) Model 2400 (L)	$ 9,990 $24,990 $34,990	8 12 24
Wang Laboratories, Inc. 1 Industrial Ave. Lowell, Mass. 01851	LPS-12 (L)	$27,995	12

E - LED printer
I - Ion printer
L - Laser printer
M - Magnetic printer

Figure 1. Some printer vendors



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	CPT Page Printer 1	Cynthia MP6090	Dataproducts LZ 2600	Delphax Systems S6000	Hewlett-Packard Laserjet 2686A	Quality Micro Systems Lasergrafix		Talaris Systems 800
						800	2400	
Approximate price	$10,000	$50,000	$12,900	$35,000 (OEM)	$3,495	$9,995	$35,000	$9,990
Fonts								
Style (type)	C,P	27	C,G+(O)	S	C+(O)	300 SPD	300 SPD	S,R+SPD
Max. design size (points)	12	96	N/A	15	16	36 SPD	36 SPD	72
Magnification	No	No	No	No	No	SPD	SPD	1-5
Total No.	10	27	4	2	8	SPD	SPD	SPD
No. downloaded	No	16	No	Yes(PO)	No	Yes	Yes	25+ SPD
No. in firmware (ROM)	2 +(O)	4 (8 max.)	4	2	1 +(O)	12 +(O)	12 +(O)	9 +(O)
No. of font/line	4	24	1	2	8	SPD	SPD	SPD
No. of font/page	4	24	1	2	8(O)	SPD	SPD	SPD
Variable width	Yes	Yes	Yes	Yes	Yes(O)	Yes	Yes	SPD
Generation	No	Yes	No	No	No	Yes	Yes	Yes
Forms capability	No	Yes(O)	Yes	Yes(O)	No	Yes(OL)	Yes(OL)	No
Host interfaces								
Software (names)								
Text processing	No	No	T	No	W	Q,T,X	Q,T,X	M,T,X
Graphics output	No	No	Yes(PO)	No	Yes	R	R	R
Other	No	No	P(PO)	No	T	C,S,T,P	C,S,T,P	Q,S
Hardware	N/A	N/A	SPD	N/A	SPD	SPD	SPD	D,V
Operating systems	N/A	N/A	SPD	N/A	SPD	A,B	A,B	B,V
Controller								
Emulation	No	No	L,D,E(O)	I (O)	L	C,T,U,V	C,T,U,V	D,Q,T
Interface	P	G,M	G,P	G,B+(O)	R	R,P,G+(O)	R,P,G+(O)	R,P,A,G,C-E
Processor	Intel 8085	NS 8031	TI 32010	LSI-11	MC68000	MC68000	MC68000	MC68000
Local memory	No	D,T(O)	D	D,T,W	No	No	D	No
RAM (char. image)	350K bytes	12K bytes	32K bytes	.5M byte	72K bytes	2M bytes	2M bytes	2.4M bytes
ROM (fonts)	14K bytes	32K bytes	8K bytes	64K bytes	NA	.5M bytes	.5M bytes	416K bytes
Bit map (graphics)	1M byte	No	Yes(PO)	1M byte+(O)	59K bytes	Yes	Yes	Yes
Job output stacker	No	Yes	Yes(O)	Yes(O)	No	No	Yes	Yes
Pages output								
Page/min	12	90	26	60	8	8	24	8
Page/mo (max.)	10,000	1M to 1.5M	40,000	.1M to 1.5M	3,000	5,000	50,000	5,000
No. page/drum belt	10,000	10M	100,000	1M	N/A	N/A	50,000	N/A
Print engine	Ricoh	N/A	Toshiba	A2460	LBP-CX	LBP-CX	XP2400	LBP-CX
Resolution (dot/in.)	300	240	300	240	300	300	300	300 (full page)

Figure 2. This small sample of nonimpact printers illustrates the range in print engines and prices.

Key

NA - information not available
N/A - not applicable
OL - optical overlay for logos, letterheads, signatures
O - optional
PO - planned offering
SPD - software product dependent (optional)

Fonts

C - Courier
G - Letter Gothic
O - OCR-B
P - Prestige Elite
R - Roman
S - Sans Serif

Host interfaces

Emulation

C - Calcomp
D - Diablo 630 daisywheel printer
E - Epson
I - IBM 3211 emulation
L - Line printer
Q - Qume Sprint 9/45, 55 daisywheel printer
T - Option: Tektronix 4010 graphics emulation
U - Tektronix 4014 graphics emulation
V - Versatec

Hardware

D - Decsystem 10 and 20
V - DEC VAX-11s

Interface

A - IBM 3270
B - IBM data channel
C - IBM 3276
E - IBM 8100
G - Dataproducts parallel
M - BP1500
P - Centronics parallel
R - RS-232C

Local memory

D - Disk
T - Magnetic tape
W - Workstation

Software

Graphics

I - Impress
R - QMS Plot

Other

C - CCSI-Plot
P - Postscript
Q - Qdrive
S - Scribe
T - Tplus

Text

M - Mass-11
Q - Qtroff
T - Troff
W - Word processing or spreadsheet
X - TEX: Used primarily for generating mathematical equations.

Operating systems

A - AT&T System V Unix
B - Berkeley 4.2BSD Unix
V - DEC VMS

array of diodes. On the other hand, magnetic printers employ a row of perpendicular recording heads to magnetize areas of the drum surface, thereby simulating the laser scanning process.

Pros, cons

Among the advantages of the electronic page printers, as compared with the more conventional mechanical printers, are high print speed, high performance/price ratio, the ability to change typefaces automatically, graphics capability and typesetting. They offer a wide selection of fonts; handle forms, logos and electronic signatures; can intermix text and graphics; operate quietly (generally less than 55 dba); and produce high-quality output (at high resolutions). The disadvantages include the limit to the number of pages per month of output (product dependent), a potential increase in maintenance costs and reliability comparable to regular photocopiers.

Equipment suppliers can be identified by referencing periodical indexes such as the *Science and Technology Index.* For disciplines in which rapid technological advancements occur, it becomes necessary to survey the marketplace frequently. It is predicted that there will be at least 50 different print engines by the end of 1985.

My survey of the marketplace performed in November 1984 turned up a total of 22 vendors of low-end, nonimpact printers (five to 20 page/min). The vendor list is shown in Figure 1. (IBM, which introduced its 3820 laser printer this past February, has been added to the list.) Suppliers of magnetic and ion printers are included in the list, regardless of print speed, because they represent newly emerging technologies of which the reader should be aware. In the LED area, Sanyo Business Systems Corp. of Moonachie, N.J., is reportedly developing a printer to be priced at approximately $3,100 that will output 20 page/min.

Some of these printers are achieving speeds approaching those of laser printers that cost five to 10 times more. For example, the Delphax Systems 86000 ion printer prints 60 page/min and is available to OEMs at a cost of approximately $35,000. Xerox Corp. recently acquired 50% of Delphax Systems. For the most part, the vendors listed here supply the necessary hardware or software interfaces to enable utilization of the printers and do not actually manufacture the print engine.

> *Hardware and operating system dependencies soon arise once the user attempts to take advantage of some features such as graphics or multiple page fonts.*

Following is a list of the basic print engine manufacturers: Cynthia Peripheral Corp., Delphax, Honeywell, Inc., IBM, Uppster and Xerox.

In West Germany, there is Siemens Corp. In Japan, the manufacturers include Canon, Fujitsu Ltd., Hitachi Ltd., Minolta, Panasonic Co., Ricoh and Toshiba, Ltd.

The companies who develop the interfaces or controllers for the print engines include Dataproducts Corp., Electronic Machine Corp., Imagen Corp., Personal Computer Products, Inc. and Rasterization, Inc.

Some companies that integrate the controllers with the print engines are Imagen, Quality Micro Systems, Inc. and Office Automation Systems, Inc.

Vendors often give different names to different features. Comparing printers therefore requires distinguishing which features are the same. One such term is "proportional spacing," which is also expressed as "variable width fonts."

Some printers can digitize a document locally for transmission back to and storage on the host computer by scanning a document placed on the glass window. This feature is extremely handy in creating new fonts for logos or electronic signatures and so on, but its ultimate use is left to the user's imagination. Generally, for a printer that does not support this feature, a separate unit can be purchased and interfaced to it.

A local copy capability is an integral part of some printers, enabling them to be used as a standard copier. Another attractive feature is the ability to distinguish between the output of several different tasks. Job separation is beneficial in a multiuser environment.

Job separation is accomplished by an offset stacker or an output stacker or collator. An offset stacker separates each job's output by shifting the output a few inches left or right, while the output stacker separates material by utilizing separate distinct bins. For printers without this capability, job separation can be accomplished by the software through the use of a title page separator.

These printers typically can accommodate standard and legal paper sizes, ranging in weight from 16 to 24 lb. Some can also handle other paper sizes such as European, ledger, fanfold and the A and B series sizes. Multiple input trays of varying capacity may be provided as optional or standard equipment. They permit concurrent use of several paper sizes or may simply increase the machine's input tray capacity. Selection of a given input paper tray on some printers can be performed under software program control.

Another desirable feature, provided via a manual-feed capability, is the ability to handle nonstandard paper types, such as envelopes, transparencies, post cards, business cards and labels.

For the most part, the printers can be interfaced to any hardware, provided that the proper interface is available — for example, an RS-232 or a Centronics Data Computer Corp. parallel interface. However, the existence of these interfaces only permits the printer to be used in a manner analogous to a conventional printer.

Points to watch

Hardware and operating system dependencies soon arise once the user attempts to use some printer features such as graphics or multiple page fonts. At this point, software, which is necessary in order to utilize these features, enters the picture with its accompanying hardware and operating system dependencies. The availability of software to drive these printers becomes a critical issue. Without it, some printer features cannot be used.

Another item that needs to be clarified is printer resolution. Even though a printer may be capable of achieving a resolution of 300 dot/in., it may not be capable of maintaining that resolution for an entire page of output. This deficiency generally results from the lack of local memory to bit-map an entire page, say 8½ by 11 inches.

For example, the Hewlett-Packard Co. Laserjet 2686A has only 59K bytes of local random-access memory, which when used for full-page graphics can only achieve resolutions of 75 dot/in.

In Figure 2 (on ID/5), optional printer features explicitly identified by the vendor are labeled as such. However, for the sake of brevity, price is not listed. The price specified for the printers does not include discounts or any optional features. In order to use all of the printer features, such as a graphics capability, software must be acquired from the printer vendor or a third-party software firm (see Figure 3).

The cost of the software can add substantially to the cost of the printer. Depending on the application, the cost may exceed the printer price.

Some print engines have a limited life with respect to the number of output pages, after which the entire print engine must be replaced. Since several different levels of maintenance may be available, it is important that the buyer be aware of what parts are covered within a maintenance agreement.

Printers are generally offered as a complete package, except sometimes for additional fonts or special interfaces. For example, in order to support a user's graphics requirements, it may be necessary to purchase an optional controller or additional host software.

Certain printer features may not have the software to support them right now. For example, a printer with the capability to perform graphics or intermix text and graphics on a page of output may not have the required software for the given environment (for example, Gould, Inc.'s Concept 32/6705 running Unix BSD 4.2).

In the course of reaching a purchase decision, trade-offs and compromises inevitably occur.

About the author

Vincent Cavo is a programmer/analyst for the State University of New York College of Technology in Utica.

Adobe Systems, Inc.
1870 Embarcadero Road
Palo Alto, Calif. 94303

Postscript: Page description device-independent programming language that describes the appearance of text, images and graphics for a printed page.

Cerritos Computer Services, Inc.
4320 Atlantic Ave., Suite 1
Long Beach, Calif. 90807

CCSI-Plot: Graphics routines package that permits intermixing of text and graphics. Source code is provided.

Imagen
2660 Marine Way
Mountain View, Calif. 94043

Impress: Page layout and description language for typesetting and graphics.

Interleaf, Inc.
1100 Massachusetts Ave.
Cambridge, Mass. 02138

OPS-2000: Permits intermixing of text and graphics.

Microsystems Engineering Corp.
Suite 400
2400 West Hassell Road
Hoffman Estates, Ill. 60195

Mass-11: Word processing package.

Quality Micro Systems
1 Magnum Pass
Mobile, Ala. 36618

Quic (QMS Utility for Image Creation): Permits intermixing of text and graphics by intermixing the data with special control codes.

Qtroff: Used in combination with "troff" and "DI troff" for device-independent output.

Talaris Systems, Inc.
7840 Herschel Ave.
P.O. Box 8309
La Jolla, Calif. 92038

QMS Plot: Graphics routines package (library) around which graphics application software can be developed. Source code provided by Talarius.

Q Drive: High-level menu-driven software that permits intermixing of text and graphics. Source code provided by Talarius.

Textware International
P.O. Box 14
Harvard Square Station
Cambridge, Mass. 02238

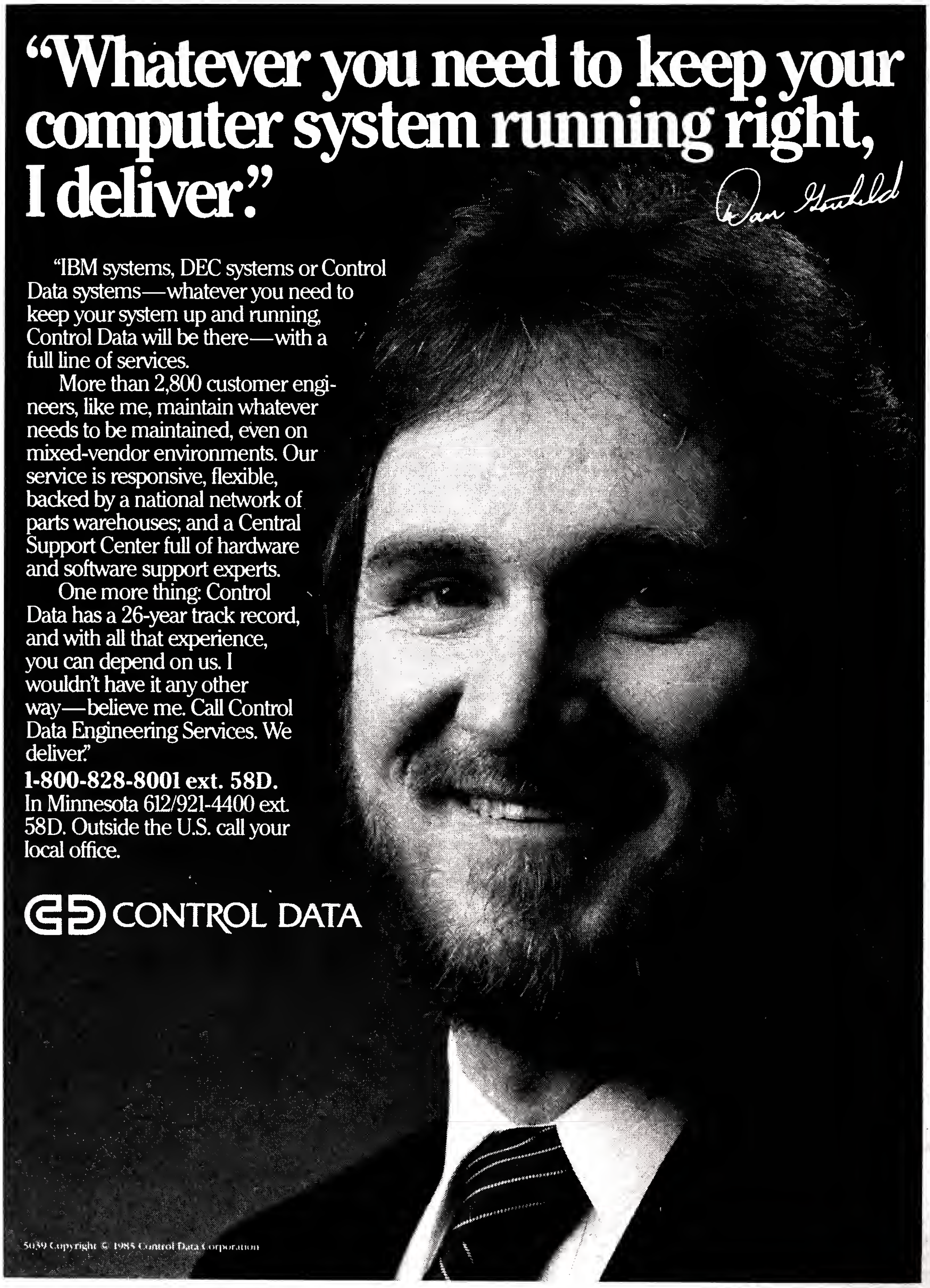
Tplus: Postprocessor to troff which permits intermixing of text and graphics, provided that troff allows it. The new AT&T troff does permit intermixing of text and graphics, provided that the preprocessors PIC, Ideal, EQN and TBL are available.

Unilogic, Ltd.
160 N. Craig St.
Pittsburgh, Pa. 15213

Scribe: Used in general word processing applications where only a limited equation handling capability is needed. Does not require user computer sophistication as does troff or tex. Permits intermixing of text and graphics.

Troff is available from several sources. Users can check with printer vendor.

Figure 3. Some software products and vendors



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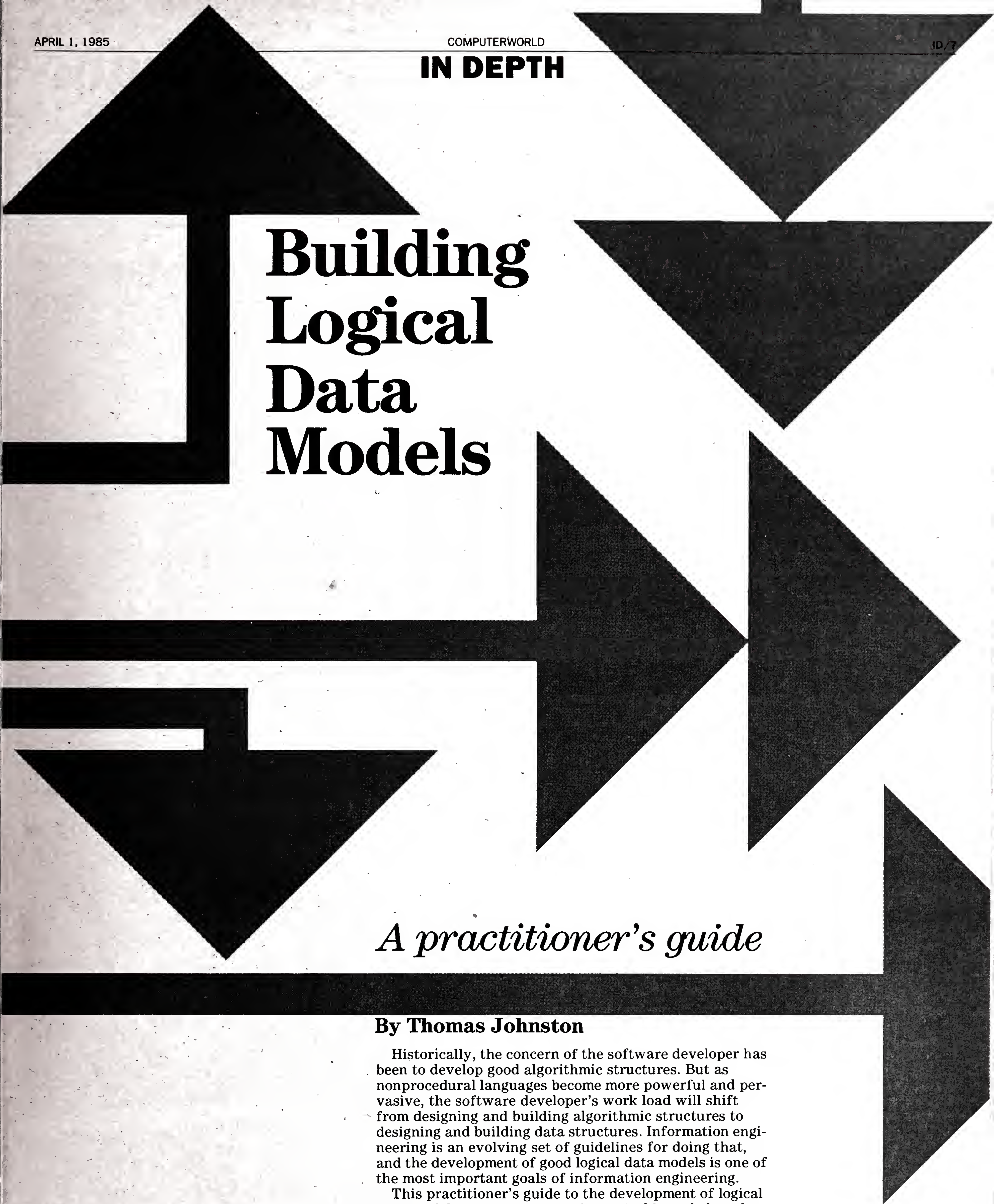

Building Logical Data Models

A practitioner's guide

By Thomas Johnston

Historically, the concern of the software developer has been to develop good algorithmic structures. But as nonprocedural languages become more powerful and pervasive, the software developer's work load will shift from designing and building algorithmic structures to designing and building data structures. Information engineering is an evolving set of guidelines for doing that, and the development of good logical data models is one of the most important goals of information engineering.

This practitioner's guide to the development of logical data models assumes a basic theoretical knowledge of data normalization, in particular, a familiarity with the first three normal forms and the use of foreign keys to implement them in a relational framework.

A logical data model, specifically, is:

■ A data dictionary of well-defined and well-named data elements, containing no homonyms or synonyms. Each data element means one thing, and no two data elements mean the same thing.

■ A set of data groups in third normal form, with relationships implemented by propagating primary

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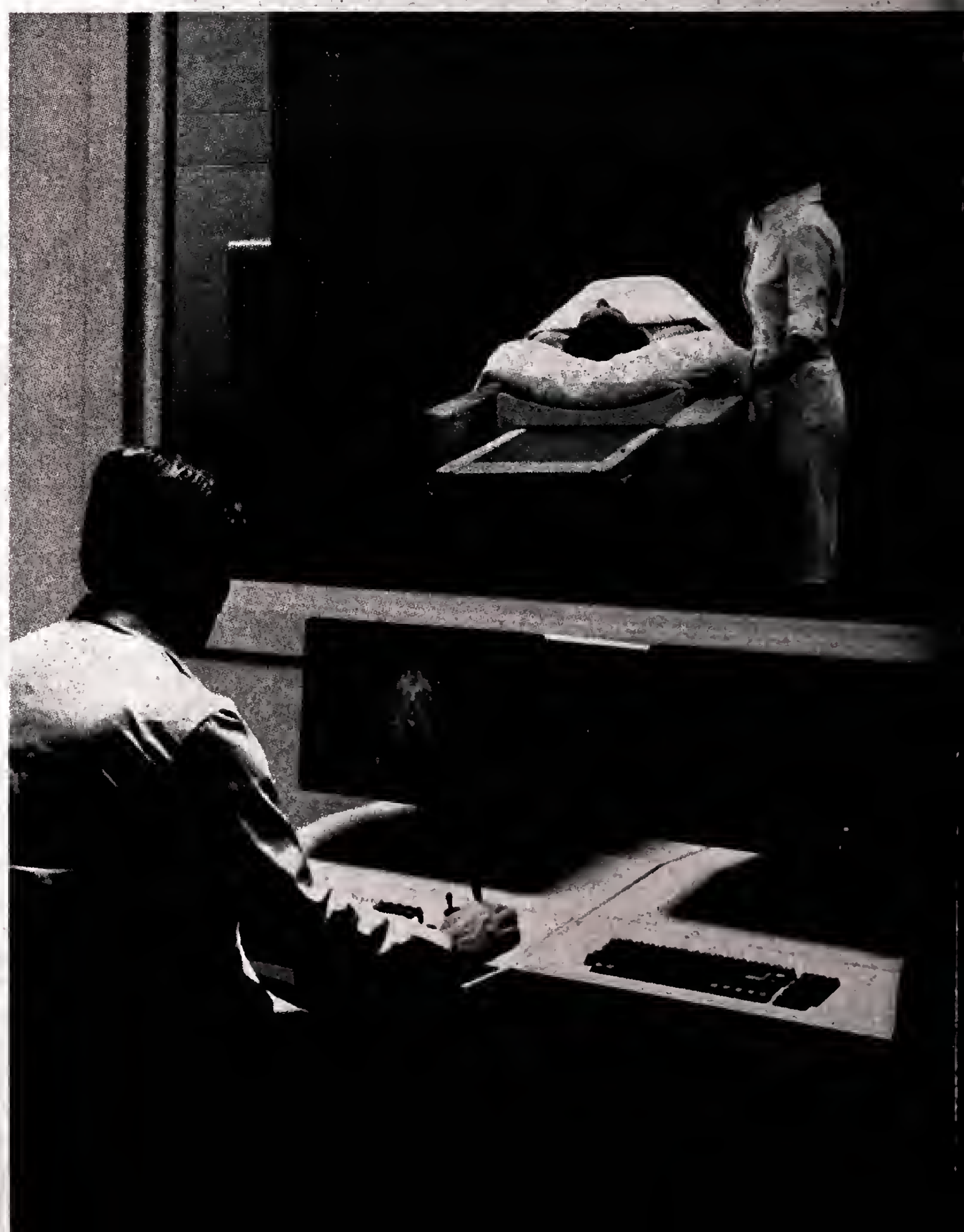
"We chose Perkin-Elmer for speed, compute power and huge I/O capacity. Now we're reaping the benefits."

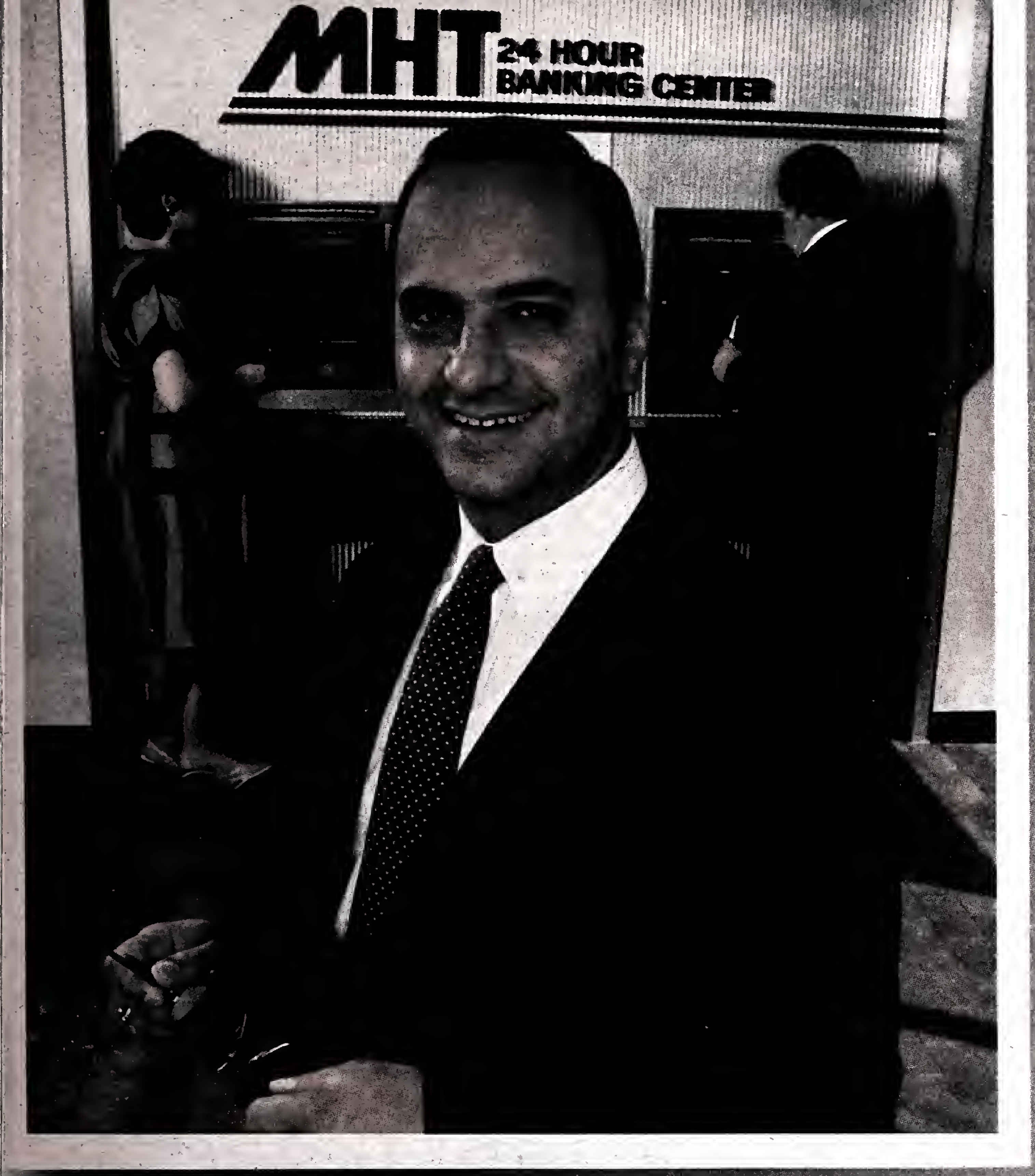
KEVIN KENNY

Kevin Kenny is President of J.J. Kenny Co., Inc., the municipal bond industry's largest "broker's broker." Trading through a network of 750 satellite-linked terminals, Kenny has cataloged a descriptive database (MUNIBASE) for an incredible 1.5 million issues.

The operation depends on powerful Perkin-Elmer 3250 superminicomputers, performing multi-processing tasks, over 2,000 real-time transactions per day (up to $200 million), plus batch processing of updated issues overnight.

As J.J. Kenny has grown, the system has grown with it. To Mr. Kenny that's meant solid investment protection. "Though our database has expanded considerably, we've never had to change the basic software."





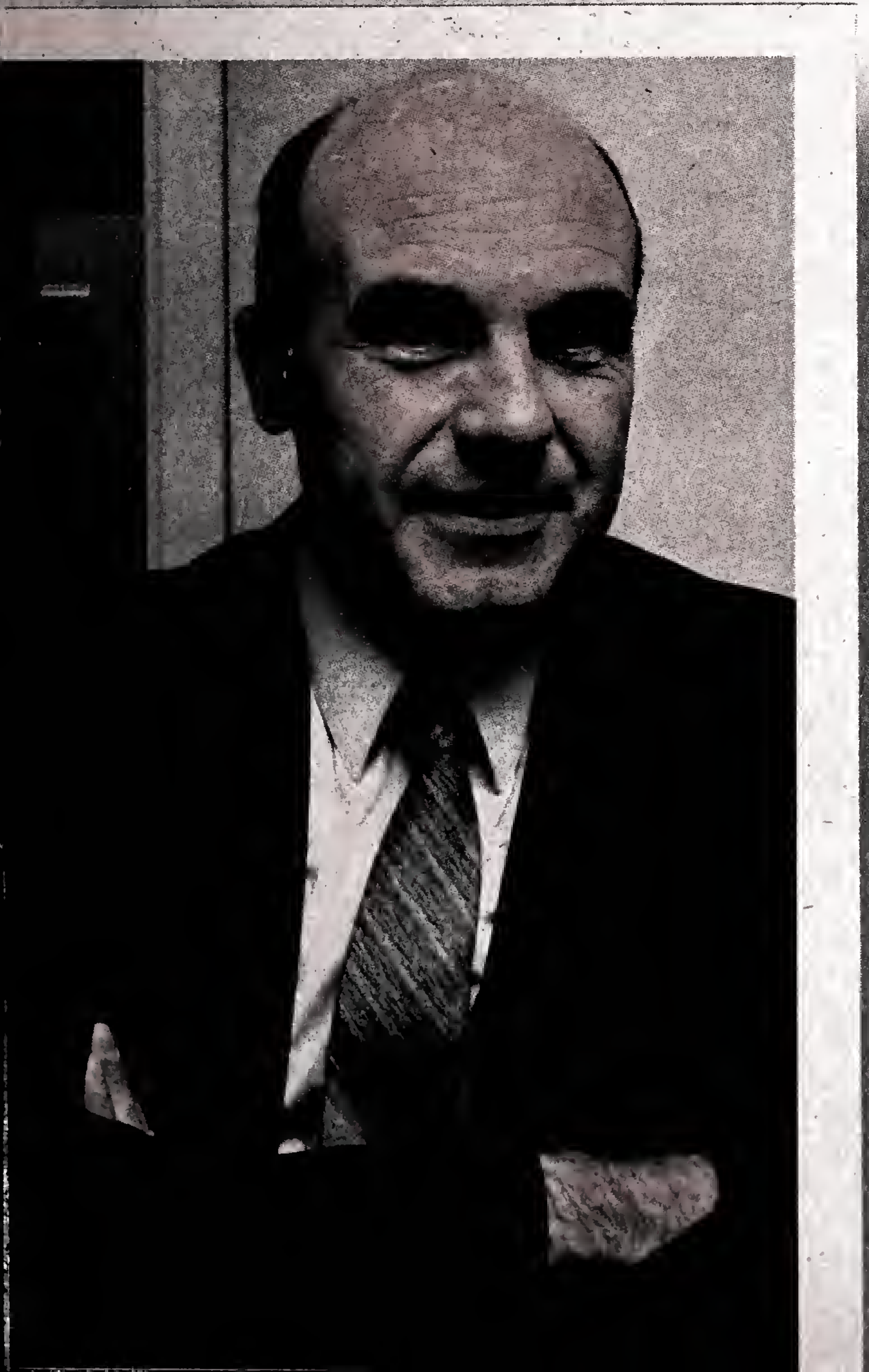
"I've never seen more reliable hardware. We've never had to switch over to the back-up system."

ROBERT DeVIVO

Manufacturers Hanover Trust Co. Assistant Vice President Robert DeVivo chose Perkin-Elmer superminis to optimize the banking giant's Automated Teller Machine (ATM) capability.

With two processors—one on-line and the other for batch and back-up—the state-of-the-art system now handles 165 ATMs, as well as communications for ATM sharing through the Cirrus network. With virtually no downtime.

Beyond reliability, Mr. DeVivo emphasizes vendor support. "Perkin-Elmer takes the time to understand our needs; they are responsive and willing. We have made the right choice, without a doubt."



"In a life-or-death emergency, accurate diagnostic data is needed in seconds. No other machine in its price range has that kind of computational power."

CARL BRUNNETT

As Technical Director of Picker International, Carl Brunnett has primary design responsibility for Picker's Computed Tomography (CT)—or "Cat Scan"—systems. For the past 10 years, he has depended on Perkin-Elmer computers.

The Picker CT Scanner converts 2 million data points into a high resolution image in just 12 to 22 seconds. With leading-edge throughput and image quality, Picker systems utilize their 32-bit processor's exceptional data handling capabilities through incredibly sophisticated software.

"Upward compatibility has enabled us to improve performance," Mr. Brunnett added, "without having to change the computer. The Perkin-Elmer has more than enough power for expandability."

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keys as foreign keys in related data groups.

■ A schematic of these data groups, based on the Bachman convention of using "----->" to represent a 1:1 and "----->>" to represent a 1:M relationship.

■ A method for assessing the adequacy of logical data models by proofing them against user views of the application being developed.

The use of foreign keys is a hallmark of relational data base management systems (DBMS) and one reason they appear so natural to the user. There are no relationships implemented with hidden machinery (external pointers, internal pointer segments) whose workings are understood only by technicians. It is also the principal reason they are so flexible; any future request for data that could logically be met according to the rules of the enterprise can be accommodated by relational cut-and-paste operations — without the need for modifications to the machinery.

In relational DBMS, these are the relationships among data groups and the way foreign keys implement them:

■ 1:1 relationships implemented by propagating the primary keys of the "from" data groups as foreign keys in the "to" data groups, enforcing the rule that the foreign key data elements can have no duplicate values.

■ 1:M relationships implemented by propagating the primary keys of the "from" data groups as foreign keys in the "to" data groups, with duplicates permitted in the foreign key data elements.

■ M:M relationships implemented as 1:M relationships with intersection data groups whose keys are made up of the primary keys of the intersecting data groups. Duplicates are permitted in each component of the intersection data group primary keys, the components being foreign keys of the intersecting data groups.

The following steps are based on actual experience in developing logical data models. Emphasis is given to the problems that may be encountered in trying to follow them.

Step 1: Enter a representative set of user views into text editor files.

If master files of a relevant system are available, the analyst should use them as the basis for constructing the logical data model. They are likely to be more comprehensive (to contain more of the data elements that belong in the model) than any set of reports or input transactions. And they are a manageably small set to work with, usually on the order of one or two dozen discrete files. Any comparably comprehensive set of reports, screens, input transactions and so on would be several times as large. In this approach, the term "user view" should be taken to refer to any combination of data that occurs within the system, so that programs, for example, are "users" whose files are user views.

Figure 1 shows some of the master

3.13.1	co-mstr-rec1
3.13.1.1	co
3.13.1.2	rec-code
3.13.1.4	co-desc
3.13.1.6	co-desc-line-2
3.13.1.7	city
3.13.1.10	num-acctg-mo
3.13.2	co-mstr-rec2
3.13.2.1	co
3.13.2.2	rec-code
3.13.2.5	ar-type-ind
3.13.2.8	ar-disc-terms
3.13.2.14	stmnt-ind
3.13.5	co-mstr-rec3
3.13.5.1	co
3.13.5.2	rec-code
3.13.5.4	ar-gl-acct-num
3.13.5.5	sales-gl-acct-num
3.13.5.6	tax-gl-acct-num
3.13.19	co-mstr-rec4
3.13.19.1	co
3.13.19.2	rec-code
3.13.19.3	div-num
3.13.19.4	dept-num
3.13.19.5	org-desc
3.13.19.6	assigned-mngr-desc
3.13.21	co-mstr-rec5
3.13.21.1	co
3.13.21.2	rec-code
3.13.21.3	acc-num
3.13.21.4	acc-desc-1
3.13.21.7	db-cr-ind
3.13.29	co-mstr-rec6
3.13.29.1	co
3.13.29.2	rec-code
3.13.29.3	trm-cd
3.13.29.4	trms-desc
3.13.29.8	disc-pct
3.13.35	co-mstr-rec7
3.13.35.1	co
3.13.35.2	rec-code
3.13.35.3	acctg-per
3.13.35.5	fscl-mo-yr
3.13.35.7	acct-per-desc
3.22.1	cust-mstr-rec
3.22.1.1	co
3.22.1.3	cust-num
3.22.1.7	city
3.22.1.16	trms-cd
3.22.1.17	type-ind
3.22.1.20	div-num
3.22.1.21	dept-num
3.22.1.27	cust-sales-1
3.22.1.28	cust-sales-2
3.22.1.29	cust-sales-3
3.22.1.30	cust-sales-4
3.22.1.31	cust-sales-5
3.22.1.32	cust-sales-6
3.22.1.35	bill-to-cust-num
3.23.3	inv-hdr-rec
3.23.3.1	co
3.23.3.2	cust-num
3.23.3.3	inv-num
3.23.3.7	inv-date
3.23.3.10	inv-due-date
3.23.3.13	orig-inv-amt
3.23.3.14	inv-bal-amt
3.23.3.15	inv-disc-date
3.23.3.18	inv-disc-poss-amt
3.23.3.19	inv-sales-amt
3.23.3.20	tax-amt
3.23.3.22	po-num
3.28.1	prod-mstr-rec
3.28.1.1	co
3.28.1.3	ctg
3.28.1.4	prod
3.28.1.5	desc
3.28.1.8	unit-cst
3.28.1.9	unit-price
3.28.2	prod-ctg-mstr-rec
3.28.2.1	co
3.28.2.3	ctg-num
3.28.2.4	desc
5.15.2	inv-line-items-rec
5.15.2.1	appl-ind
5.15.2.2	co
5.15.2.3	type-cd
5.15.2.6	cust-num
5.15.2.7	inv-num
5.15.2.11	ctg-num
5.15.2.12	prod-num
5.15.2.13	qty
5.15.2.14	prod-sale-amt
5.15.2.19	prod-cost-amt
5.15.2.20	div
5.15.2.21	dept

Figure 1. Master files of source system

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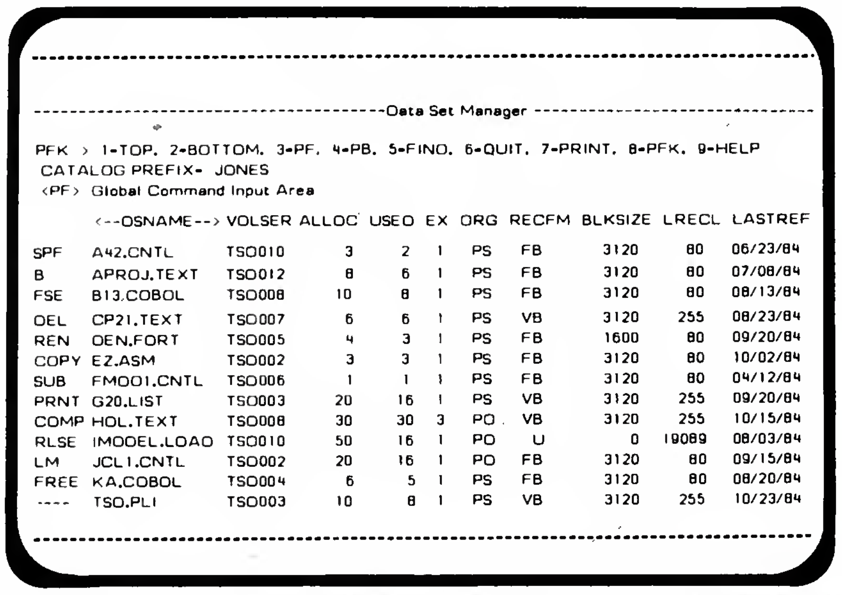

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PFK > 1-TOP. 2-BOTTOM. 3-PF. 4-PB. 5-FIND. 6-QUIT. 7-PRINT. 8-PFK. 9-HELP
 CATALOG PREFIX- JONES
 <PF> Global Command Input Area

       <--DSNAME--> VOLSER ALLOC USED EX ORG RECFM BLKSIZE LRECL LASTREF

SPF    A42.CNTL     TSO010     3    2  1  PS   FB     3120    80 06/23/84
B      APROJ.TEXT   TSO012     8    6  1  PS   FB     3120    80 07/08/84
FSE    B13.COBOL    TSO008    10    8  1  PS   FB     3120    80 08/13/84
DEL    CP21.TEXT    TSO007     6    6  1  PS   VB     3120   255 08/23/84
REN    DEN.FORT     TSO005     4    3  1  PS   FB     1600    80 09/20/84
COPY   EZ.ASM       TSO002     3    3  1  PS   FB     3120    80 10/02/84
SUB    FMOD1.CNTL   TSO006     1    1  1  PS   FB     3120    80 04/12/84
PRNT   G20.LIST     TSO003    20   16  1  PS   VB     3120   255 09/20/84
COMP   HOL.TEXT     TSO008    30   30  3  PO   VB     3120   255 10/15/84
RLSE   IMODEL.LOAD  TSO010    50   16  1  PO    U        0 19089 08/03/84
LM     JCL1.CNTL    TSO002    20   16  1  PO   FB     3120    80 09/15/84
FREE   KA.COBOL     TSO004     6    5  1  PS   FB     3120    80 08/20/84
----   TSO.PLI      TSO003    10    8  1  PS   VB     3120   255 10/23/84
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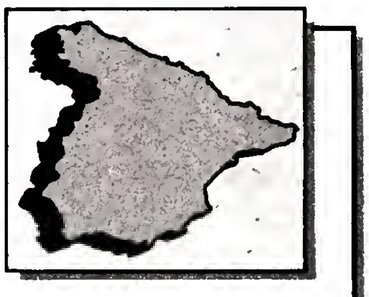

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MAI Basic Four, 14101 Myford Road, Tustin, California 92680 • Tel: (714) 731-5100 • Telex: 4720187 files contained in a subset of an accounts receivable system and some of the data elements in those master files. The numbers on the left make it possible to track intermediate and final products back to the original source system data elements and data groups; they are an audit trail.

Potential problems: The entire data base design effort can be derailed at the outset if the analyst does not begin with a manageably small set of views. Vendors of data base design aids such as Data Designer advocate development of logical data models by synthesizing user views. Each view is normalized, bubble-charted and entered into the computer; the design aid then synthesizes the views into a preliminary data model.

What is wrong with this approach is that until the analyst has a thorough understanding of the meaning of each data element, his bubble charts will not be accurate. The kinds of mistakes made in initial bubble charts of views are the following:

- Foreign key occurrences may not be identified initially, because the same data element will have quite different names on different reports. It takes considerable knowledge of the application and the subject area before these synonyms are seen to be different names for a single data element. Consequently, in initial bubble charts, synonyms may abound; this means that foreign key relationships may be overlooked.
- Spurious data groups may be created initially. Often, the analyst makes mistakes in bubble-charting reports that contain detail lines following a header group. He will chart detail lines as single data groups and assume that their key is among the data elements farthest to the left on the line. But often, detail lines are assembled from multiple data groups, and elements from the same data groups may appear in both header and detail areas on reports. Finally, primary keys sometimes do appear toward the right on the printed page.

Step 2: Scrub out the implementation-specific data elements, leaving only those that would be found in any adequate system of its type.

This step is necessary when the logical data model is being constructed bottom-up from one or more existing applications. The advantage of bottom-up construction is that the resultant model is less likely to be overly simplistic; the dangers of reflecting undesirable idiosyncrasies of an individual system are minimized by the normalization process itself.

They can be further minimized by starting from two relevant systems and also by combining bottom-up synthesis with top-down decomposition of the fundamental entities of concern — using such methodologies as entity-relationship analysis (Chen) or Business Systems Planning data decomposition (IBM).

Potential problems: Scrubbing the implementation-specific data elements is not as straightforward as it sounds. For example, while it is pretty obvious that batch control totals or internal switches controlling the traversal of menu trees should be scrubbed, what should be said about a switch indicating that a general ledger extract has been made? Or a switch preventing the system from running after Report A unless Report B has also been run?

No matter what heuristic rules are developed for scrubbing, it ultimately gets down to semantics and application knowledge — to knowing what data elements mean, what those data elements do and, finally, what the application should do for the end user. However, given that knowledge, this step can be interpreted to mean keeping data elements that fall into one of the following two categories:

- A data element presented to the end user (whether on a screen, a report, a query or the like) that he might reasonably be expected to find helpful in managing a company's receivables (in the case of this accounts receivable example).
- A data element not presented to the end user but that controls a decision that any adequate system of its type would have to make.

In this case, the former would include such obvious data elements as customer number, customer balances and various subtotals and totals on balances. It would exclude batch control totals, transaction error codes and messages and other performance-monitoring data elements not specific to accounts receivable.

The latter would include switches for clearing and rolling totals at period-end, creating file extracts to feed general ledger and sales analysis and an open-item vs. balance-forward customer type code. It would exclude restart and recovery flags and switches controlling the sequence of reports, provided the sequence would not be required of any adequate accounts receivable system.

Step 3: Find the native and foreign key occurrences of primary key data elements and give them the same name as the key data element itself. Name and define the relationships that the foreign key occurrences implement.

Figure 2 shows the results of this step, in which foreign keys have been identified and named. The relationships that have been annotated are those implemented by means of foreign keys that occur as nonkey attributes. Relationships implemented by foreign keys that occur as primary keys are generally perspicuous and so have not been annotated. (The data dictionary is being populated as data elements are named and defined, but is not shown here.)

Potential problems: Because the different foreign key occurrences of a data element implement different relationships but the name of the data element remains the same,

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```
3.13.1      CORPORATE ENTITY GENERAL INFORMATION DATA GROUP
3.13.1.1      CE-ID
3.13.2.8        TERMS-ID     <<-----  corporate entity level default terms code.
3.13.5.4        ACCT-ID      <<-----  the AR account number in GL.
3.13.5.5        ACCT-ID      <<-----  the AR sales account number in GL.
3.13.5.6        ACCT-ID      <<-----  the AR tax account number in GL.

3.13.19     ORGANIZATIONAL UNIT DATA GROUP
3.13.19.1     CE-ID
3.13.19.3     ORG-UNIT-ID
3.13.19.4       ORG-UNIT-ID <<-----  the parent organizational unit, if any.

3.13.21     CORPORATE ENTITY CHART OF ACCOUNTS
3.13.21.1     CE-ID
3.13.21.3     ACCT-ID

3.13.29     TERMS CODE DATA GROUP
3.13.29.1     CE-ID
3.13.29.3     TERMS-ID

3.13.35     ACCOUNTING PERIOD DATA GROUP
3.13.35.1     CE-ID
3.13.35.3     ACCT-PER-ID

3.22.1      CUSTOMER DATA GROUP
3.22.1.1      CE-ID
3.22.1.3      CUST-ID
3.22.1.16       TERMS-ID     <<-----  customer level default terms code; intermediate
                                      between corporate entity level and invoice level.
3.22.1.21       ORG-UNIT-ID <<-----  lowest level organizational unit responsible for
                                      customer.
3.22.1.35       CUST-ID      <<-----  the CUST-ID of the bill-to customer; when pres-
                                      ent, 3.22.1.3 is the ship-to customer.

3.22.1      CUSTOMER SALES TOTALS DATA GROUP
3.22.1.1      CE-ID
3.22.1.3      CUST-ID
3.13.35.3     ACCT-PER-ID

3.23.3      SALES INVOICE DATA GROUP
3.23.3.1      CE-ID
3.23.3.2      CUST-ID
3.23.3.3      INVC-ID

5.15.2      SALES INVOICE LINE ITEM DATA GROUP
5.15.2.2      CE-ID
5.15.2.6      CUST-ID
5.15.2.7      INVC-ID
5.15.2.12     PROD-ID
5.15.2.20       ORG-UNIT-ID <<-----  organizational unit whose cost accounts are im-
                                      pacted.
5.15.2.21       ORG-UNIT-ID <<-----  organizational unit whose inventory is impacted.

3.28.1      PRODUCT MASTER DATA GROUP
3.28.1.1      CE-ID
3.28.1.4      PROD-ID

3.28.1      PRODUCT/CATEGORY MASTER DATA GROUP
3.28.1.1      CE-ID
3.28.1.3      CAT-ID
3.28.1.4      PROD-ID

3.28.2      PRODUCT CATEGORY MASTER DATA GROUP
3.28.2.1      CE-ID
3.28.2.3      CAT-ID
```

Figure 2. Foreign keys and relationships

those different relationships must be named and defined. For example, ACCT-ID always points back to the Chart of Accounts Data Group, where it is the key. But in one data group, it may represent a corporate entity total of sales tax, while in another it may represent a "bucket" for the amounts on invoice line items.

Until the analyst knows which data elements are going to be primary keys, he cannot identify their foreign key occurrences and name those occurrences correctly. This situation requires him to normalize before he names, so that he will know which data elements are keys.

For example, if he did not know that a certain fiscal date was going to be the primary key for the accounting-period data group, he would give different names to its different occurrences (he would create synonyms). The relationship of the accounting-period data group to other data groups would, therefore, fail to be made.

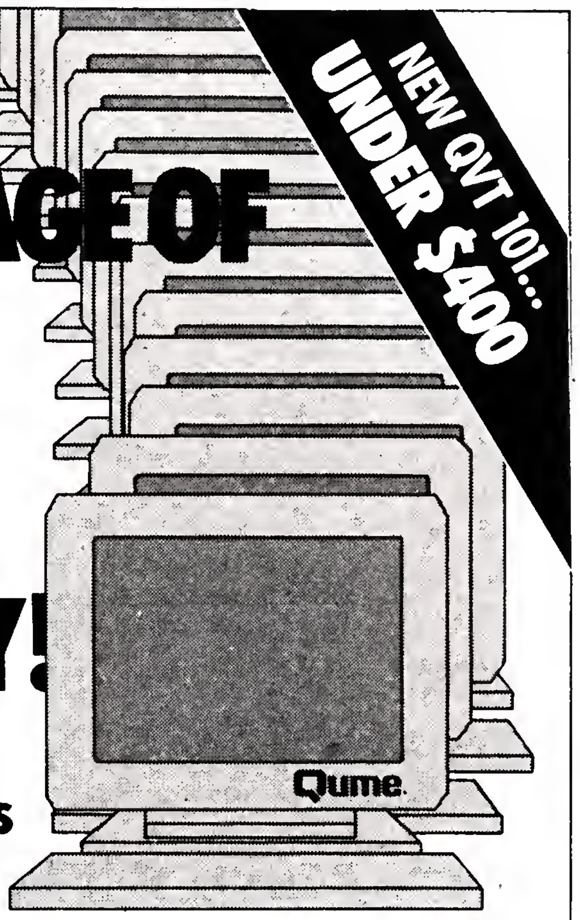
On the other hand, the analyst cannot normalize a mass of data elements that likely contains both homonyms and synonyms; it is a scrubbed set of data elements that should be normalized. He must name before he normalizes. As to synonyms, if a single data element is called by different names on four different reports, it will appear as four different elements in the data model.

If several of its occurrences are thought to be key data elements, it will lead to the creation of spurious data groups. All occurrences of a single data element must be identified and given the one name assigned to that data element.

As to homonyms, no homonym can be fully functionally dependent on any primary key, unless by accident the two (or more) semantically distinct elements it represents both happen to be dependent on the same key. The two or more data elements it combines should be separately defined and named and each put into its appropriate data group.

The solution to this chicken-or-egg problem is, unremarkably enough, that neither naming nor normalizing comes first. But rather than trying to name everything all at once, the analyst should concentrate on the structural elements, that is, the keys that distinguish data groups from one another and that, as foreign keys and intersection data group keys, relate data groups to one another.

Step 4: Name and define all remaining (nonkey) data elements. Put each in the data group that has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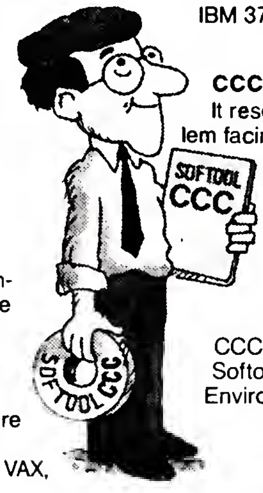

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```
3.13.1     CORPORATE ENTITY GENERAL INFORMATION DATA GROUP
           This data group contains all data elements that describe the corporate entity, including
           corporate entity-level defaults for several data elements.
3.13.1.1       CE-ID
3.13.1.4           CE-DESC
3.13.1.10          CE-NUM-ACCT-MO-CODE
3.13.2.5           CE-AR-CUST-TYPE-CODE
3.13.2.8           TERMS-ID
3.13.2.14          CE-STMT-IND-CODE
3.13.1.7           CE-CITY
3.13.5.4           ACCT-ID
3.13.5.5           ACCT-ID
3.13.5.6           ACCT-ID

3.13.19    ORGANIZATIONAL UNIT DATA GROUP
           This data group contains data that describes one organizational unit within a corporate entity.
           An organizational unit could be a division, department, section and so on.
3.13.19.1      CE-ID
3.13.19.3      ORG-UNIT-ID
3.13.19.4          ORG-UNIT-ID
3.13.19.5          ORG-UNIT-DESC
3.13.19.6          ORG-UNIT-MGR-NAME

3.13.21    CORPORATE ENTITY CHART OF ACCOUNTS
           This data group contains all accounts used by the corporate entity.
3.13.21.1      CE-ID
3.13.21.3      ACCT-ID
3.13.21.4          ACCT-DESC
3.13.21.7          ACCT-DB-CR-CODE

3.13.29    TERMS CODE DATA GROUP
           This data group contains the terms codes for the system, from which a due date, discount
           amount and discount due date may be calculated.
3.13.29.1      CE-ID
3.13.29.3      TERMS-ID
3.13.29.4          TERMS-DESC
3.13.29.8          TERMS-DISC-PCT

3.13.35    ACCOUNTING PERIOD DATA GROUP
           This data group contains accounting periods for the current accounting cycle of the corporate
           entity. ACCT-PER-ID is a calendar month/year.
3.13.35.1      CE-ID
3.13.35.3      ACCT-PER-ID
3.13.35.5          ACCT-PER-FISC-DATE
3.13.35.7          ACCT-PER-DESC

3.22.1     CUSTOMER DATA GROUP
           This data group contains information on AR customers.
3.22.1.1       CE-ID
3.22.1.3       CUST-ID
3.22.1.7           CUST-CITY-CODE
3.22.1.16          TERMS-ID
3.22.1.17          CUST-AR-TYPE-CODE
3.22.1.21          ORG-UNIT-ID
3.22.1.35          CUST-ID

3.22.1     CUSTOMER SALES TOTALS DATA GROUP
           This data group contains information on the total sales amount for each customer in each
           accounting period of the current accounting cycle.
3.22.1.1       CE-ID
3.22.1.3       CUST-ID
3.13.35.3      ACCT-PER-ID
3.22.1.27          CUST-ACCT-PER-SALES-TOT-AMT

3.23.3     SALES INVOICE DATA GROUP
           This data group contains "header" information on sales invoices.
3.23.3.1       CE-ID
3.23.3.2       CUST-ID
3.23,3.3       INVC-ID
3.23.3.7           INVC-DATE
3.23.3.10          INVC-DUE-DATE
3.23.3.13          INVC-ORIG-AMT
3.23.3.14          INVC-RMNG-BAL-AMT
3.23.3.15          INVC-DISC-DUE-DATE
3.23.3.18          INVC-DISC-POSS-AMT
3.23.3.19          INVC-TOT-SALES-AMT
3.23.3.20          INVC-TOT-TAX-AMT
3.23.3.22          INVC-REF-PO-NUM-CODE

5.15.2     SALES INVOICE LINE ITEM DATA GROUP
           This data group contains information on line items of sales invoices.
5.15.2.2       CE-ID
5.15.2.6       CUST-ID
5.15.2.7       INVC-ID
5.15.2.12      PROD-ID
5.15.2.13          INVC-PROD-QTY
5.15.2.14          INVC-PROD-XTND-PRICE-AMT
5.15.2.19          INVC-PROD-XTND-COST-AMT
5.15.2.20          ORG-UNIT-ID
5.15.2.21          ORG-UNIT-ID

3.28.1     PRODUCT MASTER DATA GROUP
           This data group contains product information.
3.28.1.1       CE-ID
3.28.1.4       PROD-ID
3.28.1.5           PROD-DESC
3.28.1.8           PROD-UNIT-COST-AMT
3.28.1.9           PROD-UNIT-PRICE-AMT

3.28.1     PRODUCT/CATEGORY MASTER DATA GROUP
           This is a M:M relationship between products and categories.
3.28.1.1       CE-ID
3.28.1.3       CAT-ID
3.28.1.4       PROD-ID
3.28.1.5           CAT-PROD-DESC

3.28.2     PRODUCT CATEGORY MASTER DATA GROUP
           This data group contains information on product categories.
3.28.2.1       CE-ID
3.28.2.3       CAT-ID
3.28.2.4           CAT-DESC
```

Figure 3. Schemata of the logical data model

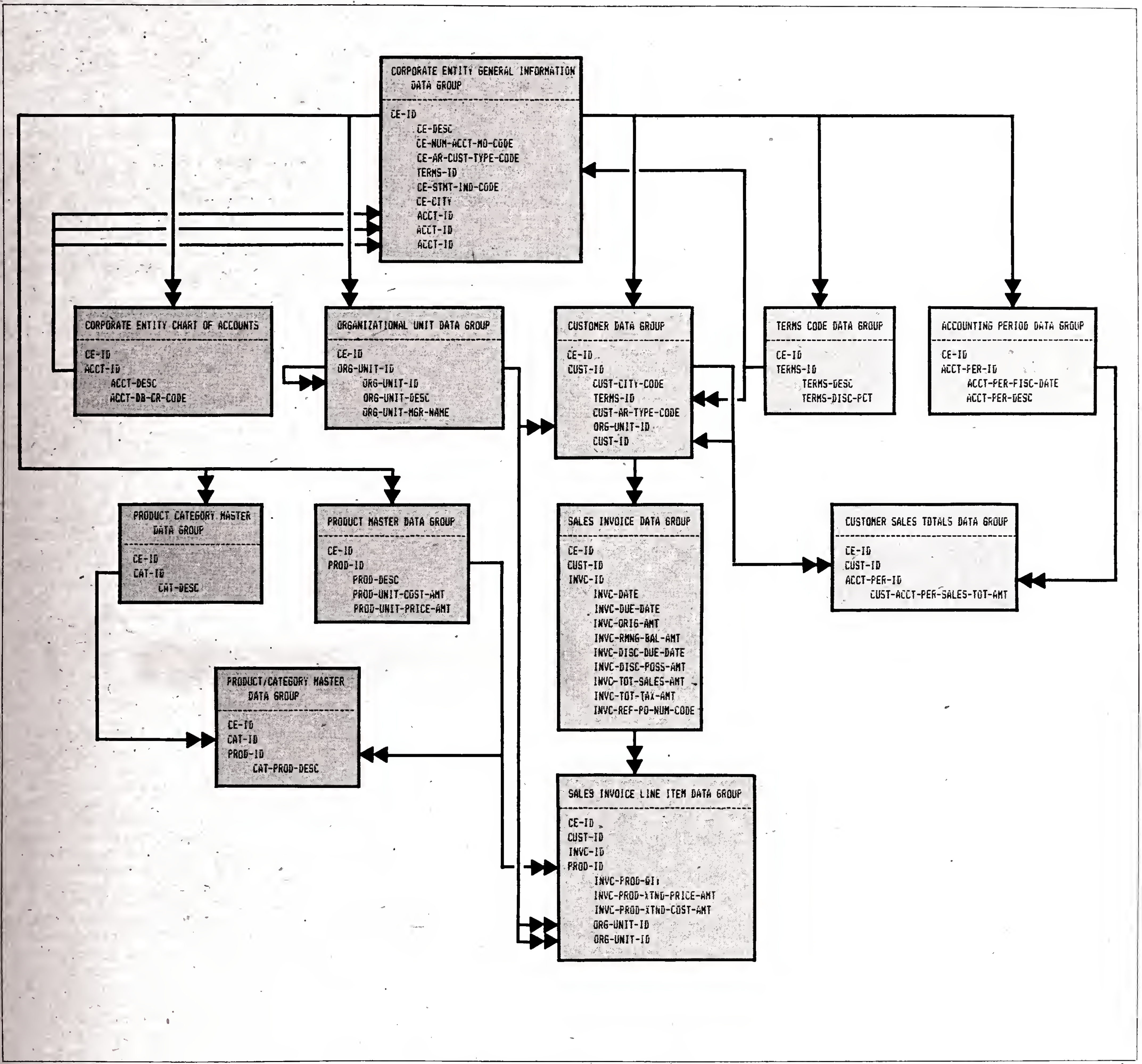

Figure 4. Logical data model diagram

the primary key upon which it is fully functionally dependent. Create new data groups where necessary to ensure that all data groups in the logical data model are in third normal form.

The next task is to assign each nonkey data element to the data group whose primary key it is fully functionally dependent upon, creating new data groups where necessary to preserve third normal form. This step is almost as straightforward as textbooks make it seem. Assuming that the rules defining the first three normal forms are understood, what is needed to make this step work is simply a set of data elements whose definitions are understood by the analyst. Figure 3 shows the results of this step — a complete set of logical schemata for the subject area being normalized.

Potential problems: Most of the homonyms and synonyms should have been weeded out by this point, but a few may remain. Remaining homonyms are likely to appear as data elements that seem to belong in more than one data group; if this situation cannot be resolved, then there are two meaning units ("morphemes," to linguists) combined under one name, which should be split apart and named separately. If this is done correctly, each should then go easily into its appropriate data group.

Remaining synonyms are likely to manifest themselves as foreign key relationships that should be there but are not. The reason the relationships are not there is that a foreign key occurrence has been given a separate name and listed as a nonkey data element.

In an earlier version of this logical data model, for example, there was no Accounting Period Data Group; each occurrence of the data element ACCT-PER-ID was given a separate name. Then it was realized that a fiscal date was needed for a report of customer sales totals. This led to the creation of the Accounting Period Data Group, in which fiscal dates

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were paired with accounting periods. Each separately named occurrence of an accounting period in the other data groups was then replaced by ACCT-PER-ID, thus documenting the foreign key relationship by which the correlation with fiscal date was established.

Step 5: Proof the logical data model against the significant user views. These include transaction records, batch-control records, error reports, other unedited listings, intermediate files, formatted reports, file extracts for interfacing to general ledger, screen displays, query listings and so on.

Steps 1 through 4 create a provisional logical data model. In building it, the analyst deepens his application knowledge and his knowledge of the semantics of the data elements and groups. He avoids trying to normalize a mass of user views before he has this essential knowledge.

With this provisional logical data model, he can then take one significant user view at a time — reports, input transactions, data entry, update or inquiry screens — and normalize those views, recording them as bubble charts.

If he cannot accommodate the views without creating new keys, then he adds the corresponding data group to the logical data model. Otherwise, he simply adds any new data elements to the data groups indicated in the bubble charts and already present in the logical data model.

Potential problems: Reports raise the issue of derived data elements, for they normally contain several levels of totals, and the question is whether or not to include them in the logical data model. The answer is to do so if and only if convenient; if the end user does not need to see the derived data element anywhere except on the report, then there is no need to store it.

However, that total may be a periodic snapshot of a summarization. The report may be run weekly, but better control might be achievable if the total was updated and presented daily or even updated continuously and presented on demand. In such cases, the total should be stored as a data element.

Figure 4 on ID/15 shows a modified Bachman schematic of the final model. All M:M relationships have been resolved into 1:M relationships with intersection data groups. Where two or more semantically distinct relationships exist between the same two data groups, separate arrows have been shown for each relationship. Again, it should be emphasized that this does not represent a complete accounts receivable system but only selected data elements and data groups from such a system.

Final product

As to methodologies, sole reliance on bottom-up synthesis of user views will not readily produce a good logical data model. There is more than an analogy with a view of the scientific method that was prevalent several decades ago: that science proceeds by inductive generalization from observable matters of fact.

This view is no longer held by philosophers of science. Many of the astronomical observations on which Galileo based his support of the Copernican theory, for example, were in fact compiled by Tycho Brahe, but interpreted by him to support the Ptolemaic theory. The inductive generalization description ignores the fact that any nontrivial set of facts can support multiple interpretations — here, that any nontrivial set of user views can support multiple logical data models.

This is the theoretical mistake implicit in pure bottom-up normalization, that is, normalization of user views followed by synthesis into a data model. But there is a practical mistake also — the mistake of getting swamped by too many views. Without expert application knowledge, the analyst needs to select a manageably small set of views, which nonetheless will encompass most of the data to be included in the model.

This approach makes room for a learning curve. The experience of constructing a provisional model will always produce a deeper understanding of the application than passively reading books or manuals or interviewing end users. Once the provisional model has been constructed, books, manuals, end users and user views are all significantly more meaningful.

As for tools, a grease board and a text editor are the best tools for developing logical data models. During the early design stages, changes come fast and furious, and a delay of even an hour is oppressive. Instant responsiveness is more important than any sophistication of tools. Changes can be made to a grease-board model instantly; changes to text editor data can be available on a local printer within minutes.

The model should be developed and proofed on the grease board or text editor until it is stable through several iterations. Only then should an automated design tool, such as Data Designer [Database Design, Inc., Ann Arbor, Mich.], PSL/PSA [Isdos, Ann Arbor, Mich.] or Excelerator [Index Technology Corp., Cambridge, Mass.], be used. The value of the tool is then as an organized repository for a final or near-final logical data model. It will not materially assist, and may actually hinder, the process of developing the model.

About the author

Thomas Johnston is a data base consultant with Rehab Group, Inc., Atlanta, Ga., which provides information systems planning, analysis, design and development services to federal agencies. RGI is currently working on the specification of a Continental Army management information system for the U.S. Army Forces Command.

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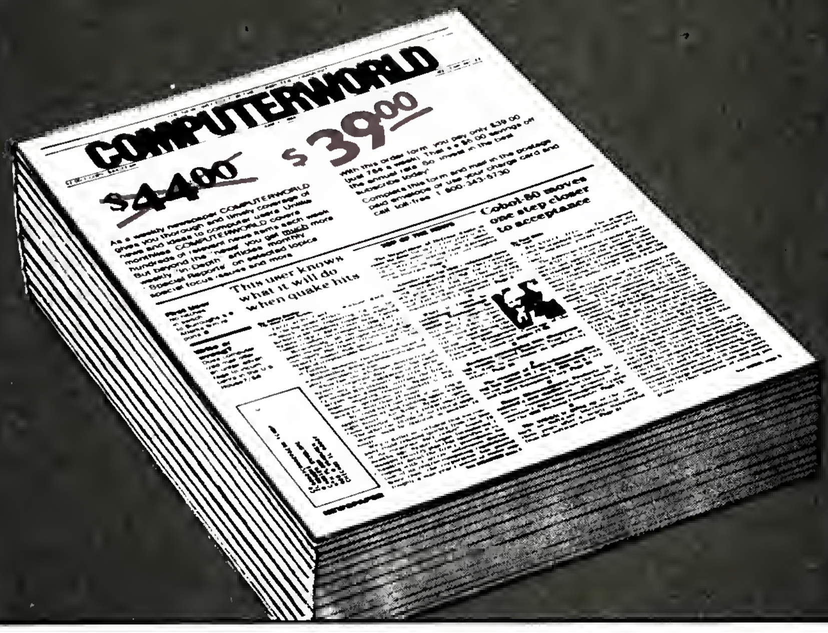
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Rx: Computing power

Hospital goes multiuser route for DP needs

By Kathleen Sullivan
CW West Coast Bureau

COUPEVILLE, Wash. — Whidbey General Hospital, a rural hospital located on Whidbey Island, which hugs the northern Washington coastline, had once cast its eyes longingly on mainframe-based information systems. "But we didn't have the resources to purchase a mainframe, so that was out of the ballpark for us," said Robert Maxwell, the hospital's controller.

So Whidbey General decided to take a different route to meet its data processing needs. About a year ago, the hospital installed a multiuser microcomputer system, the Personal Mini 16 (PM16), developed by Televideo Systems, Inc., and bought a custom-designed medical management software package offered by a Washington-based software house.

Now the 50-bed hospital has the computing power that would normally be found in a facility four times its size, Maxwell said. "Most U.S. hospitals that have data processing capabilities are much larger than Whidbey General's," Maxwell said. "Usually, you must have 200 beds just to be able to afford an order entry system and financial resources five to 10 times as big as ours."

Maxwell estimated that the hospital spent about $150,000 on the system, including research and development costs, a figure he said represented one-tenth the outlay for an equivalent mainframe system.

Maxwell, like two other PM16 users interviewed by *Computerworld,* gave Televideo high marks for its system. Attracted to the PM16 because of its architecture and low cost, all three users said they had found the system to be reliable.

Earl Mott, an in-house computer consultant at the Moline, Ill.-based John Deere Co. headquarters, said the system's network software, designed by Utah-based Novell, Inc., was the driving force in the

See **TELEVIDEO** page 60

Turbo Pascal micro tool gets enhancement

SCOTTS VALLEY, Calif. — Borland International has enhanced Turbo Pascal, a Pascal applications development environment that runs on a number of microcomputers.

The enhanced program reportedly compiles and executes programs at twice the speed of previous versions. Other enhancements include a memory-mapped editor and a feature that allows a user to develop graphics programs, the vendor said.

The enhanced package also is said to allow users to build their own applications library subroutines and offers optional support for Binary Coded Decimals.

Turbo Pascal consists of a compiler, an editor and a simple spreadsheet. It runs on micros with IBM's PC-DOS, Microsoft Corp.'s MS-DOS and Digital Research, Inc.'s CP/M-80 and CP/M-86 operating sys-

See **PASCAL** page 62

- Ryan-McFarland has introduced a version of its RM/Cobol for IBM's PC/IX operating system/**56**
- Front Row Systems announced software that creates customized menus for Lotus Development's 1-2-3 package/**56**
- Emulex unveils a memory board that can boost the IBM Personal Computer AT's internal memory to 3M bytes/**56**

INSIDE

Software/**58**
Systems/**59**
Communications/**60**
Board-Level Devices/**60**

AGS unveils software

KING OF PRUSSIA, Pa. — A systems management package designed to guide managers in the development and maintenance of software systems has been introduced by AGS Management Systems, Inc. for the IBM Personal Computer.

Called Computer-Aided Methodology, the software reportedly includes development guidelines, systems management guidelines, an automated priority ranking system, automated estimating systems and an automated project planning and management system.

In the initial phase of the project's development, users are guided through the reviewing and prioritizing of service requests, AGS said. Next, the software is said to permit planning and estimation of the extent of the work involved in the project. In the work scheduling phase, the system assists in the planning, organizing and scheduling, reviewing and managing of the project. In the work management phase, the software reportedly offers the tools to measure project status and performance.

The software comes with two references and is priced at $22,950 for a single-user license. It requires at least 512K bytes of internal memory.

AGS Management Systems is located at 880 First Ave., King of Prussia, Pa. 19406.

SMALL TALK
Eric Bender
CW Senior Editor

A month for foolery

Almost every day seemed like April Fools' Day last month.

IBM drops the ax on the PCjr. The revamped PCjr is a good little machine, and it was the best-selling micro during the 1984 holiday season. But earlier this year after IBM boosted prices, sales softened, and it was time for a little Blue pruning.

And once again, the industry is waiting for the next IBM move, although the giant vendor is now trying to avoid surprising itself. Among its current concerns is the PC Network, scheduled to ship by today, which will not necessarily achieve a stunning success. ("What do you mean, rewire the entire building just for this?")

See **FOOLS** page 62

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IBM SQL/DS and DB2 relational DBMS now on PC

ORACLE, the relational DBMS compatible with IBM's SQL/DS and DB2, is now available on the IBM PC/XT and PC/AT. While SQL/DS and DB2 run only on IBM mainframes, ORACLE runs on IBM mainframes as well as on DEC, DG, HP and most other minis and micros. Any application written for SQL/DS or DB2 will run without modification on the complete range of systems supporting ORACLE, including PCs.

SQL/DS and DB2 are relational database management systems; ORACLE is a relational DBMS plus an integrated set of 4th generation software tools for application generation, report writing, color graphics and network communications.

Oracle Corporation introduced the first relational DBMS in 1979. Now, ORACLE provides the only complete implementation of the IBM-standard SQL language available for the PC.

Oracle Corporation cites three principal application areas for its product's capabilities:

■ **The ORACLE Application Development Center** provides a PC-based development center for the creation of DB2 and SQL/DS applications. The flexibility of the personal computing environment is made available to programmers creating applications for use with IBM's relational database products.

■ **The ORACLE Personal Information Center** extends the Information Center concept to the Personal Computer. ORACLE's application generator, graphics, spreadsheet and other end-user tools provide a SQL/DS and DB2 compatible Information Center on the desktop.

Users can become acquainted with the facilities and power of the Information Center in the personal computing environment, and transfer their knowledge and skills as the MIS Information Center facility evolves. The ORACLE Personal Information Center provides the facilities for MIS to develop the cooperative relationship with end users so vital to the success of the Information Center.

In addition, with ORACLE on departmental superminis, users can create identical Information Centers at the department level.

■ **The ORACLE Distributed Information Center** provides an intelligent set of communication links among multiple systems, with ORACLE running on IBM mainframes and various minis and PCs.

Using ORACLE's SQL*LINK networking facility, ORACLE on such diverse systems as MVS, VM/CMS, VAX/VMS, UNIX and PC/DOS can selectively exchange database information using the full capabilities of the SQL language. Applications, portable across all environments, can be run identically on any system, and data can be intelligently extracted for use at any site.

ORACLE is currently installed on over 1000 supermini and mainframe systems around the world, as well as on thousands of PCs and compatibles. Oracle's customers include 8 out of the 10 largest U.S. corporations, as well as major foreign companies and many government agencies.

For further information, contact Oracle Corp., Dept. C, 2710 Sand Hill Rd., Menlo Park, CA 94025, or call 415/854-7350 ext. 2043.

IBM PC/IX gets RM/Cobol

ROLLING HILLS ESTATES, Calif. — Ryan-McFarland Corp. (RM) has introduced a version of its RM/Cobol language for IBM's PC/IX operating system, which is based on AT&T's Unix System III.

Software developed under IX RM/Cobol reportedly can run on single-user systems under IBM's PC-DOS and on the Personal Computer AT under Microsoft Corp.'s Xenix, on IBM's Series 1 under Unix, on IBM's System 9000 under Xenix and on IBM's 370, 3030, 3080 and 3090 series machines and the 4300 series mainframes under VM/CMS.

IX RM/Cobol gives PC/IX users access to more than 2,000 RM/Cobol-based programs, the vendor said. IX RM/Cobol features, said to be the same as those of RM's standard RM/Cobol language, include relative and index file access methods at Level 2, the highest level of Ansi's multilevel standard.

The latest version of the language's compiler is also included, RM said.

IX RM/Cobol is also said to offer multikeyed index files with alternate and duplicate keys and a portable applications code.

A full IX RM/Cobol system is priced at $750; runtime packages are priced at $230.

RM is located at 609 Deep Valley Drive, Rolling Hills Estates, Calif. 90274.

Data base and applications tool out for IBM Personal Computers

BILLERICA, Mass. — Data Language Corp. has announced that its fourth-generation data base and applications development system now runs on the IBM Personal Computer XT, Personal Computer AT and compatible microcomputers.

According to a company spokesman, the Progress applications developer, which also runs on multiuser AT&T Unix systems, is insulated from the underlying operating system.

Data base structures can be changed without dumping or reloading data, the spokesman said.

Progress includes a recovery feature that permits an automatic back out of uncompleted transactions after a system failure.

When a Progress procedure is moved from Microsoft Corp.'s MS-DOS to Unix, multiuser capabilities are automatically invoked, the vendor said.

The Progress data base and applications development system for the IBM Personal Computer AT, Personal Computer XT and compatibles are priced at $695 for single-user systems.

Data Language is headquartered at 5 Andover Road, Billerica, Mass. 01821.

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Realia's compiler supports most IBM VS/COBOL and VS/COBOL II features, such as:

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On the IBM PC AT, your programs can run at 370/148 to 370/158 speed. Realia's file system really makes your machine deliver, giving it a distinct edge over Pascal or C. Our indexed file system even has full key compression and buffer controls just like VSAM. The generated code is pure MS-DOS, so it can be run on most of the 8088/8086 machine family.

And you can sell your programs without paying us a royalty fee.

Realia COBOL is priced at $995, including one year of maintenance and upgrades. Subsequent maintenance and upgrade contracts are currently priced at $125/year/copy. Available for the IBM PC, PC XT, 3270 PC, PC AT, PC-compatibles, and the TANDY 2000.

Realia COBOL. What a relief.

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Menu software for 1-2-3 bows

ATLANTA — Front Row Systems has announced Menu Maker software, said to permit the creation of customized menus for use with Lotus Development Corp.'s 1-2-3 software. It runs on the IBM Personal Computer line, including the Personal Computer AT, with color or monochrome screens.

Menu Maker reportedly allows users to replace the 1-2-3 menu with a menu of their own creation. The customized menus and worksheets enable users to develop complete systems in 1-2-3 and serve as a reference to aid in learning the 1-2-3 program.

Menu Maker is said to teach more advanced techniques such as accepting input and performing string manipulation and program iteration. The product reportedly includes a utility worksheet which may be inserted into any current worksheet to reduce the number of keystrokes used in 1-2-3. Menu Maker costs $50.

Front Row Systems can be reached through P.O. Box 550346, Suite 520, 8 Piedmont Center, Atlanta, Ga. 30355.

Memory board debuts for AT

COSTA MESA, Calif. — Emulex Corp. has introduced its Mega Memory, which provides up to 3M bytes of random-access memory (RAM) for the IBM Personal Computer AT.

The Mega Memory addition to Emulex's Persyst product line, a full-size printed-circuit board, fits into any of the AT's 16-bit slots. A total of six banks, representing 12 rows, can be populated, using either 64K- or 256K-bit chips.

The board comes with Emulex's Wait-less Printing print spooling software and its Insta-Drive RAM disk emulation software.

Prices range from $395 for a version without RAM but with sockets for the customer to fill with memory chips to $5,495 for 3M bytes of RAM.

Emulex can be reached through P.O. Box 6725, 3545 Harbor Blvd., Costa Mesa, Calif. 92626.

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SOFTWARE

■ **Clarity Software Corp. has enhanced its 3-2-1 GO software for the IBM Personal Computer line.**

The 3-2-1 GO software reportedly converts Lotus Development Corp.'s 1-2-3 and Symphony spreadsheets to the models and data files usable in Execucom Systems Corp.'s Interactive Financial Planning System (IFPS).

Release 2.0 of 3-2-1 GO translates all 1-2-3 and Symphony functions with equivalent definitions in IFPS and supports the new features of IFPS/Personal Release 2.0.

The vendor said 3-2-1 GO Release 2.0 is being provided free to current users and priced for new users at a corporate license fee of $3,200.

Clarity Software, Suite 206, 13276 Research Blvd., Austin, Texas 78750.

■ **Cambridge Computer Corp. has introduced its PC73/78 software for emulation of Honeywell, Inc. terminals on the IBM Personal Computer line, including the Personal Computer AT.**

Under PC73/78, the Personal Computer is said to be able to emulate the Honeywell VIP7200, VIP7300 and VIP7800 series of asynchronous terminals. The software also reportedly uses Intel Corp. 8087 or 80287 math coprocessors, if available, and provides remote and screen printing simultaneously with host inquiries and updates.

The software is priced at $395.

Cambridge Computer, 151 Bender Road, Mount Carmel, Conn. 06518.

■ **H & A Computer Systems, Inc. has introduced an IBM Personal Computer version of its Program Executive System (PXS), an integrated applications development environment previously available only on the IBM Series/1 minicomputer.**

Using PXS, applications for the Series/1 can be downloaded to the Personal Computer and run under IBM's PC-DOS, according to the vendor. Applications development will also be speeded, the vendor added, because users will be able to compile their programs on the Personal Computer itself.

PXS includes a procedurally based application development language, PXL, that reportedly provides the functionality of the C language with the ease of use of IBM's RPG language. PXS' data management capabilities include indexed, linked and direct file organization and unlimited secondary indexing.

Up to four levels of nested menus are said to be supported by the software's integrated menu manager. Data files developed under PXS are protected against accidental erasure or damage during an update.

PXS and PXL are each priced at $590.

A screen/report source code generator and a documentation system, said to be similar to a data dictionary, are available as options at $200 each, according to the vendor.

H & A Computer Systems, Suite 204, 30 Hotaling Place, San Francisco, Calif. 94111.

■ **ADP Financial Network Services, a division of Automatic Data Processing, Inc., has announced enhancement of its Cash Express Workstation financial management software for the IBM Personal Computer and Personal Computer XT.**

Cash Express Version 1.1 allows users to isolate specific account groups for analysis and to take advantage of unattended data retrieval and selective system security, a spokesman said.

Version 1.1's Cash Position Slicing function is said to allow users to view selected account groups according to specified criteria. Other enhancements reportedly allow cash managers to instruct their workstations to retrieve specific data at prescribed times each day and to limit the extent to which individual users can access the software.

The product is priced at $3,500 for a perpetual license for the IBM Personal

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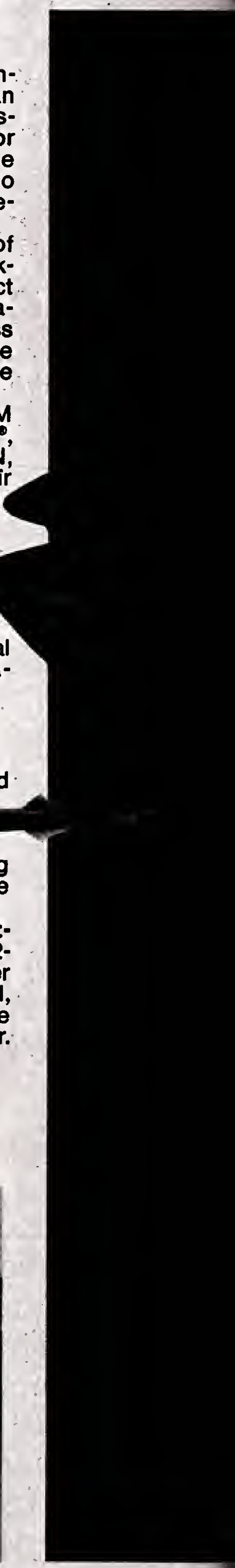

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ADP Financial Network Services, 175 Jackson Plaza, Ann Arbor, Mich. 48106.

SYSTEMS

■ **Intertec Data Systems Corp. has introduced its Headstart ATS-286, a personal computer incorporating the Intel Corp. 80286 microprocessor and reportedly offering compatibility with the IBM Personal Computer.**

Headstart ATS-286 can operate either as a single-user stand-alone or as a multiuser system when connected to an Intertec Multilan Storage System, available separately. The Multilan system is said to support up to 255 ATS workstations.

Use of the Intel 80286 is said to provide the ATS-286 with program execution at least eight times faster than that available on the Personal Computer. The Intertec system features 256K bytes of internal storage, a 12-in. screen with 80-col. by 25-line format and the capacity to display graphics with 640- by 200-pixel resolution. An optional 5¼-in. floppy disk unit provides 720K bytes of storage.

The ATS-286 is priced at $2,495. The disk unit is priced at $595. The Multilan Storage System units are priced ranging from $2,495 to $8,995, the vendor said.

Intertec Data Systems, 2300 Board River Road, Columbia, S.C. 29210.

■ **Wang Laboratories, Inc. has introduced its Engineering Support System (ESS), based on its Professional Image Computer (PIC) workstation.**

The ESS combines the PIC image-processing workstation with Autodesk, Inc.'s Autocad computer-aided drafting software package. The PIC workstation reportedly features a desktop scanner that digitizes images from sheets of paper and stores them in raster format. The images can then be composed with other previously digitized images and/or integrated with new text to form entirely new documents.

The Autocad software reportedly allows engineering professionals to capture, create, modify and combine both raster and vector images and then merge them with integrated text to form documents for specific purposes, such as engineering change orders. Drawings are stored in floating-point vector format, the vendor said.

Options for the ESS include support for Microsoft Corp.'s MS-DOS applications as well as several terminal emulation protocols, including the teletypewriter terminal emulation protocol. The ESS is priced at $20,810, including the PIC workstation, Autocad software, a monitor and thermal printer. All software needed for image composition and text integration is reportedly provided with the PIC.

Wang Laboratories, One Industrial Ave., Lowell, Mass. 01851.

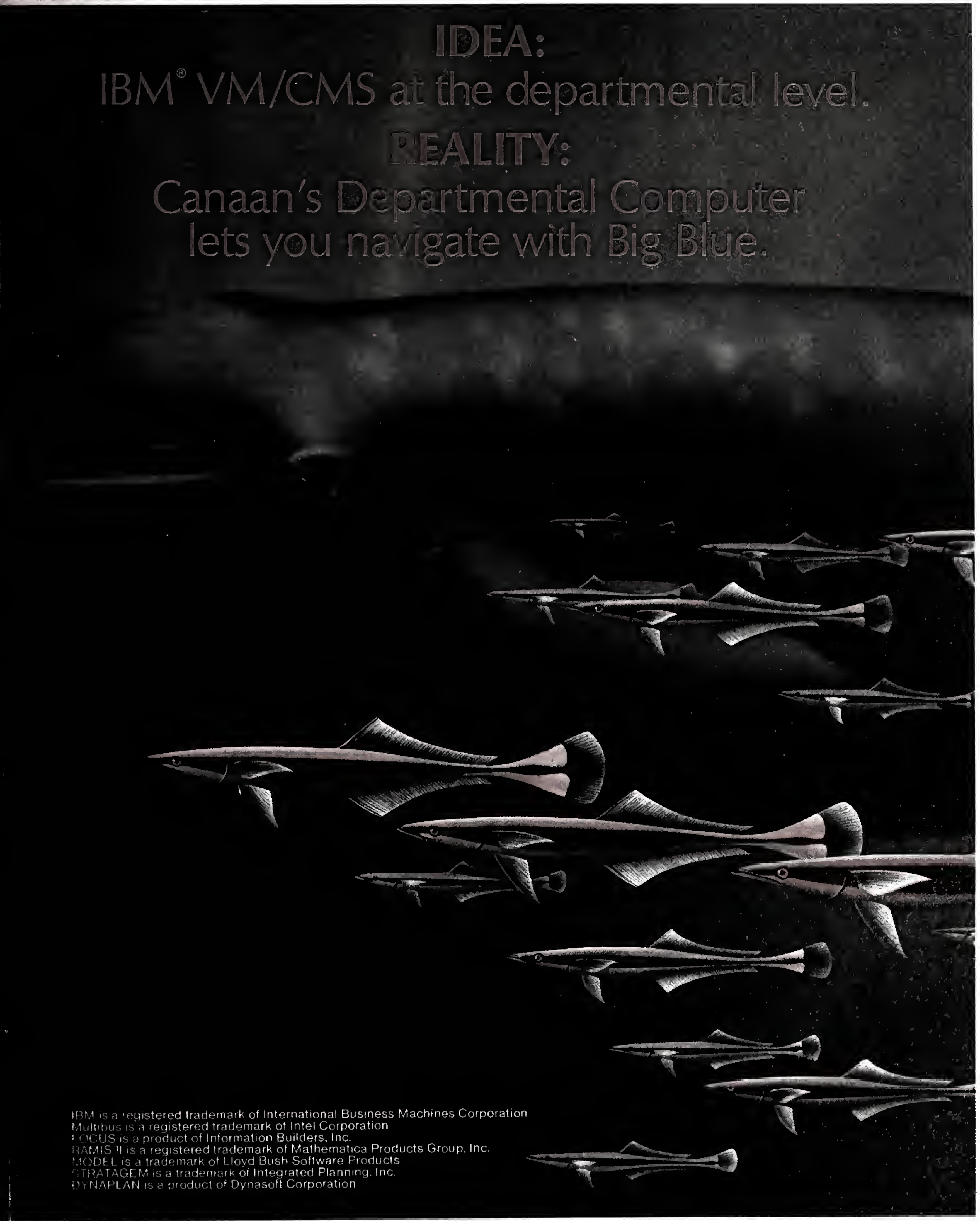
■ **Philips Information Systems, Inc. has announced the consolidation of its P3100 personal computer and its Communications Cosystem in a package called Desk Automation. The P3100's CPU and the Cosystem share the system's VDT, keyboard and printer.**

Desk Automation reportedly joins applications such as word and data processing, electronic mail, calendar and communications.

The consolidation reportedly allows the Philips P3100 and Cosystem to provide voice/data transmission over normal telephone lines, to perform speed dialing and to connect with external data bases.

The product costs $1,995.

Philips Information Systems, Suite 300, 15301 Dallas Pkwy., Dallas, Texas 75248.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COMMUNICATIONS

■ **Keyword Office Technologies has announced new document-exchange software modules for its Keyword 7000 document-interchange system.**

Two of the modules, for the IBM Displaywrite 2 text-editing software and IBM's 5520 administration system, provide links from various incompatible word processors and micros to IBM's Document Content Architecture, a spokesman said.

Other modules reportedly support Wang Laboratories, Inc.'s Office Information Systems 5¼-in. format, Office Solutions, Inc.'s Office Writer and Lanier Business Products, Inc.'s Super No Problem software.

Keyword also announced a capability for all its software to produce Ascii output, allowing documents to be moved into various environments for electronic mail, print output and interchange to other systems.

The modules cost $495 for unidirectional pairings between incompatible systems.

Keyword Office Technologies, 2047 Hamilton Ave., San Jose, Calif. 95125.

BOARD-LEVEL DEVICES

■ **Linkdata has announced a multiuser enhancement for the IBM Personal Computer that reportedly supports up to nine terminals and a printer all operating simultaneously.**

The Multi-PC/68 incorporates two enhancements to the Personal Computer to adapt it to the multiuser environment, according to the vendor. These are an add-in Motorola, Inc. 68000 processor board with up to 512K bytes of memory and an intelligent serial I/O card called Linkterm that reportedly can support four or eight additional RS-232 ports usable for terminals, printers and modems.

The add-in boards work on any standard Personal Computer, Personal Computer XT or Personal Computer AT with 128K bytes of memory and support the company's 25M-, 46M- or 66M-byte disk systems, the vendor said.

Prices for the enhancements are $2,395 for the Motorola processor, $875 for a four-port version of Linkterm and $1,225 for an eight-port version of Linkterm.

Linkdata, 2005 Rt. 22, Union, N.J. 07083.

See **BOARD** page 62

TELEVIDEO from page 55

firm's selection of the PM16. He described the Novell network's performance as outstanding.

Mott said Televideo provided an implementation of the Novell network that was "significantly cheaper" than those offered by other firms, "especially with the discounting available to John Deere." The company has installed three PM16s, which are being used by its software development staff and a variety of engineering personnel.

John Deere has connected IBM Personal Computers to its PM16s. But Mott said the company is looking forward to Novell's next version of the network software, which will allow users to hook up IBM Personal Computer ATs to the network.

Unlike Whidbey General, which relies primarily on customized software, John Deere's staff is using off-the-shelf software on the PM16. At present, the firm is using Micropro International Corp.'s Wordstar; a data base manager designed by Irvine, Calif.-based Dayflo, Inc.; and Enable, an integrated software package developed by the Software Group, a Ballston Lake, N.Y., firm.

Mott said the company first bought the PM16 to handle its word processing applications. Currently, its word processing staff is sharing 88M bytes of disk storage and two high-quality, high-speed printers. This ability to share peripherals was one of the attractive features of the system, he said.

'Zero downtime'

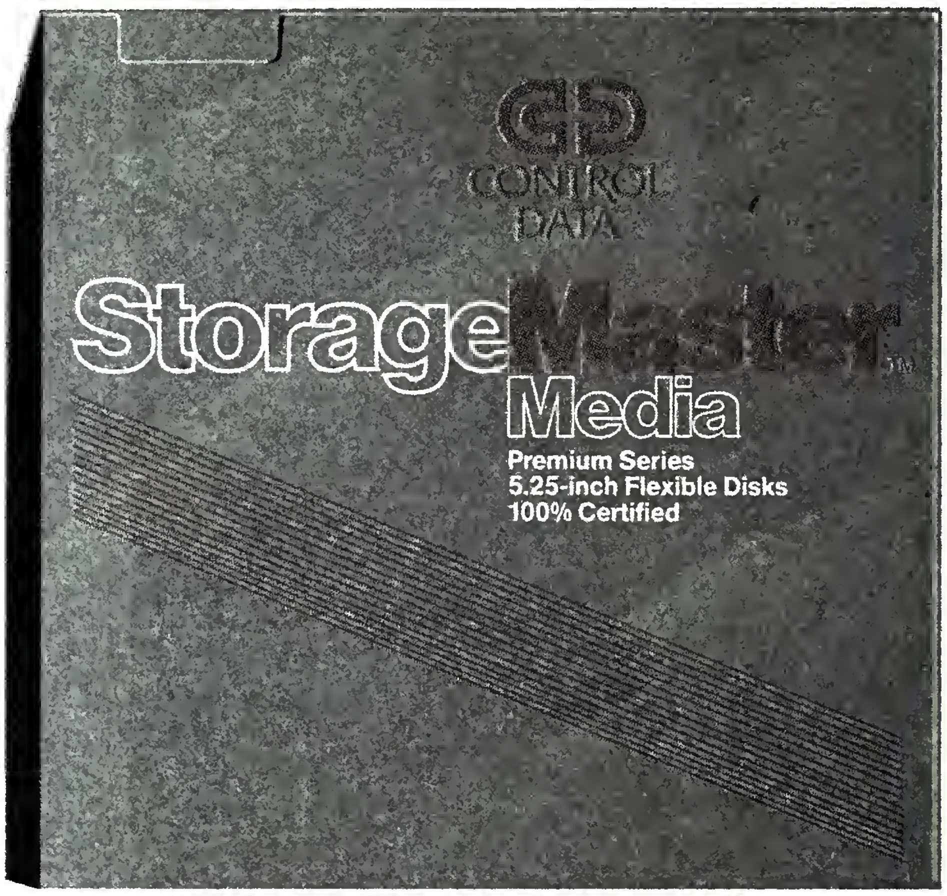
David Britton, both assistant principal and systems administrator at Fife High School in Tacoma, Wash., oversees the use of its PM16, which was installed last September. According to Britton, the system has performed flawlessly since the start of the school year. "We have had zero downtime on the system," he said.

Fife High School, which has 600 students, is using both custom-designed software and commercial packages on the system, Britton said. Its administrative operations — which include everything from monitoring attendance and producing class schedules to sending out grades — are handled by Schoolmaster, a program developed by a Tumwater, Wash., company.

Before installing the PM16, Fife shared an on-line system with 40 other school districts, a situation that sometimes resulted in competition among the districts for the system's resources — when it came time to issue report cards, for instance. Relying on a third party to produce reports proved frustrating as well, because the school would find itself waiting a couple of days to receive reports it had requested, Britton said.

He said the school was attracted to the PM16 because of its record-locking capability, a feature the school has found very important.

In addition, Britton praised the system's dynamic disk allocation, which he described as the "ultimate in disk storage." Unlike traditional hard disk systems, in which a disk is physically divided into user areas that remain fixed, dynamic allocation is flexible. The system chooses the most efficient way to store the data, he said. As a result, there is "no dead space on the hard disk," he explained.



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SPECIAL REPORT

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BOARD from page 60

■ **Winning Designs has introduced its IQ188 coprocessor expansion board for the IBM Personal Computer line.**

The IQ188 reportedly features a full Winchester disk controller, an Intel Corp. iAPX188 processor and the ability to download user-written software programs and drivers into resident random-access memory.

Using its Basic I/O System routines, custom applications reportedly can be designed. Included with the IQ188 are software for spooling to RS-232, serial and parallel interfaces as well as a subset emulator of Digital Equipment Corp. VT100 terminals and a resident iAPX188 debugger.

The IQ188 is priced at $1,595.

Winning Designs, Suite 230, 7910 Invanhoe St., La Jolla, Calif. 92037.

■ **Zilog, Inc. has introduced 2M-byte and 4M-byte memory expansion option boards for its System 8000 supermicrocomputers.**

The boards reportedly increase the System 8000's maximum memory to 8M bytes. They can be used in all models of the System 8000 family, including the Series/1, the Plus Series and the Series 2, according to the company.

The 2M-byte board is priced at $10,950. The 4M-byte board is priced at $18,950.

Zilog, Systems Division, 1315 Dell Ave., Campbell, Calif. 95008.

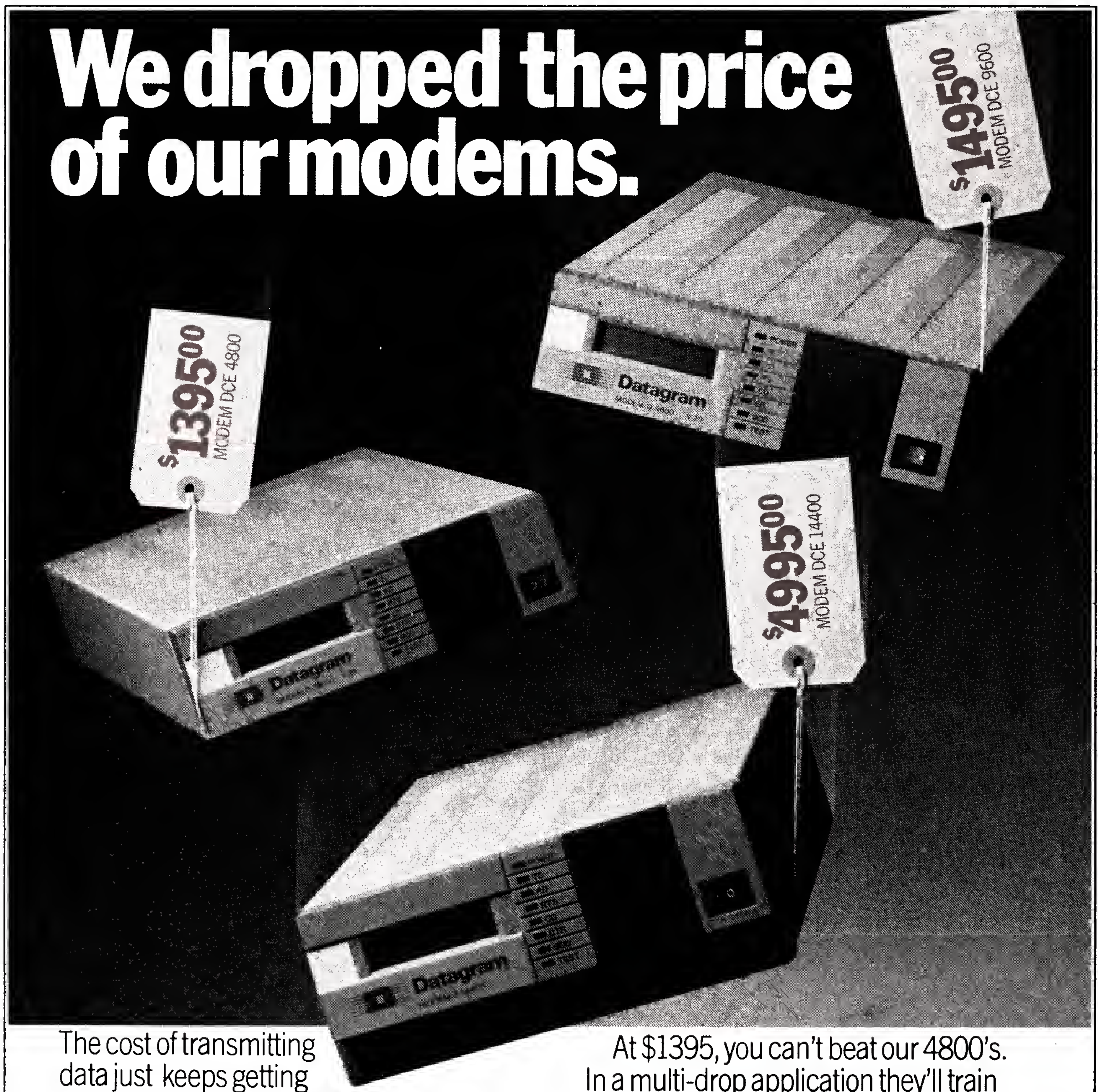
■ **Emulex Corp. has introduced its Persyst Mono Combo and Color Combo combination boards for the IBM Personal Computer line.**

Both boards are said to offer multifunction and display capacities on a single board with no use of piggybacking and to provide both monochrome and color display. They use gate array technology and offer up to 384K bytes of on-board memory, the vendor said.

Included with the boards are two software programs, Insta-Drive and Wait-Less Printing. Insta-Drive reportedly uses user-assignable random-access memory to emulate the storage capacity of up to four single-sided diskette drives. Wait-Less Printing provides user-defined buffering through automatic spooling.

The Persyst Mono Combo Card and the Persyst Color Combo Card are each priced from $520 to $1,145, depending on the amount of on-board memory.

Emulex, 3545 Harbor Blvd., Costa Mesa, Calif. 92626.



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FOOLS from page 55

Don Estridge leaves Boca Raton, Fla. The head honcho at IBM's Entry Systems Division left to supervise IBM's manufacturing operations. Perhaps IBM wanted someone else in the public eye, but the shift probably was just the normal rotation of IBM executives.

Digital Equipment Corp. still isn't over the Rainbow. Three weeks after safeguarding inventories for the Rainbow personal computer by acknowledging that production was shutting down, DEC bundled the high-end machine with office automation software and flung it out into the world again. For once, industry analysts were unanimous — stunned at DEC's refusal to accept the need for IBM compatibility.

None of that Jazz. Lotus Development Corp., which has ragged unmercifully on other software vendors for late deliveries, was forced to delay shipment of its Jazz integrated package for Apple Computer, Inc.'s Macintosh. The package is "buggy as a swamp," one Lotus insider said, and it kept crashing during public previews.

This is not the first time Lotus was late, however, although the company dodged the bullet the first time around. In April 1983, Mitch Kapor promised a second version of 1-2-3 by year end. If this package didn't evolve into Symphony (which shipped in July 1984 and thus would be six months late), it hasn't appeared at all.

People started throwing around software piracy numbers as if they meant something. A Future Computing, Inc. study found that half the business software packages in use are unauthorized, and that figure is now quoted everywhere. But those results don't get much respect in the software industry. One marketing vice-president remarked that "you or I could pull just as good numbers from the air."

Then there were the minor curiosities — such as AT&T and Compaq Computer Corp. once again making conflicting product announcements during the same week in New York, or Burroughs Corp. dashing into office automation half a decade behind everyone else.

It has all been very entertaining, and there may be other good news lurking behind all of this — that the customer choices in personal computing are not quite as predictable as they seemed a month ago.

PASCAL from page 55

tems and requires 35K bytes of random-access memory.

Turbo Pascal sells for $69.95; options that support an Intel Corp. 8087 math coprocessor or Binary Coded Decimals each cost $39.95.

Borland International is located at 4113 Scotts Valley Drive, Scotts Valley, Calif. 95066.

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COMMUNICATIONS

AT&T touts Accunet, DMI interface

By John Dix
CW Staff

ORLANDO, Fla. — An AT&T Communications spokesman recently outlined how its Accunet digital network service works with AT&T Information Systems' Digital Multiplexed Interface (DMI), an interface AT&T is promoting as a standard.

Speaking before about 100 representatives of 30 manufacturers that have pledged support or interest in DMI, Dave Ferguson, district manager of AT&T Communications custom services planning, explained how DMI and Accunet services now work together and detailed plans for future capabilities.

DMI is a signaling format that specifies how 1.54M bit/sec T1 digital transmission facilities are split into individual channels. It calls for the bandwidth to be divided into 24 64K bit/sec channels and for the use of common-channel signaling. With this signaling method, information about remote devices on 23 of the channels — such as whether they are on- or off-line — is combined in the 24th channel, Ferguson explained.

Although use of one channel is lost with common-channel signaling, the remaining 23 channels can operate at full 64K bit/sec rates because they are not encumbered by signaling data. By comparison, bit-robbing signaling techniques — as used in the Computer-to-Private Branch Exchange Interface developed by Digital Equipment Corp. and Northern Telecom, Inc. — require one bit in every byte to be used for signaling, which lowers obtainable channel speeds to 56K bit/sec.

Ferguson said customers can use AT&T Communications' Accunet T1.5 service today to interconnect PBXs and computers outfitted with DMI interfaces on a point-to-point basis. In this application, the Accunet service is essentially a 1.54M bit/sec pipe. There is one caveat: Although the service provides a clear channel over which customers can pass any type of digital information — data, voice or video — the traffic must contain a certain number of binary 1s to meet a 1s density requirement.

"Out of every 8 bits you send, you have to send at least one [1]," Ferguson said. "When you send a zero, there is no signal, and if you don't send a signal for a long

See **AT&T** page 66

■ Telematics International has introduced a network control software package designed for the company's Net 25 line of packet switches/**64**

■ DEC has announced Scholar, a synchronous/asynchronous 2.4K bit/sec modem that is said to be AT&T compatible and adhere to international standards/**64**

■ Network Systems has announced that its Hyperbus local-area network product line can now be installed with the standard IBM cabling system/**66**

INSIDE

Voice/Data Communications/**64**
Multiplexers/Modems/**64**
Local-Area Networks/**66**
Network Services/**66**

DATA STREAM
Paul Korzeniowski
CW Staff

Hype obscures issues

During a session titled "Office Automation Roundtable" at the recent Interface '85 communications conference in Atlanta, an attendee asked panelists if a software package existed that could easily notify users about a problem on a network and help a network manager locate the problem. With puzzled looks on their faces, three well-known consultants passed on the question.

This scenario illustrates some of the problems communications managers may face today. Consultants, research firms and the trade press love to talk about tomorrow, but their talk centers on pie-in-the-sky topics like voice/data integration, networking models and local-area networks that support everything. Everyone is eager to spout off about such topics, but the rhetoric's significance to real-world problems is questionable.

"A consultant will come in, examine your operation and say, 'You need a [voice/data private branch exchange], two satellite

See **PROBLEM** page 67

Fiber net use increases

Canadian phone companies convert

By Brian Banks
Special to CW‡

Cherished for years as the transmission medium of the future, fiber-optic networks are now beginning to appear in force. This month in Canada, for example, Sasktel, the provincial telephone company of Saskatchewan, will inaugurate its recently completed $56 million broadband network, a 3,268-km, fiber-optic, long-distance telephone network serving 52 communities across Saskatchewan.

At approximately the same time, CNCP Telecommunications will begin installing its first fiber-optic network, a $20 million, 720-km system that will serve the Toronto-to-Montreal corridor. And Bell Canada reports that work is proceeding ahead of schedule on its plan to convert all copper-based, short-haul telephone networks within its jurisdiction to fiber optics by the end of the century. Through the end of 1984, Bell Canada had installed more than 20,000 km of fiber-optic cable in this network. The company plans to install double that amount of cable by the end of 1986.

See **CANADA** page 67

Banks is the assistant editor of Computer World Canada, *the Mississauga, Ont.-based sister publication of* Computerworld.

Lightnet links eastern U.S.

NEW HAVEN, Conn. — Lightnet, Inc. has begun construction of the second portion of its planned 5,000-mile fiber-optic network, which ultimately is designed to link 43 cities in 24 states east of the Mississippi River. The network, a 1,077-mile route, will pass from Washington, D.C., through New York to Chicago. A 455-mile route through Florida is now operational.

The company plans to install a fiber-optic cable from New York to Princeton, N.J. Four planned routes, centering in Atlanta, will pass through Washington, D.C.; Jacksonville, Fla.; New Orleans; Chicago; and Detroit.

US Telecom, Inc. has signed contracts with Lightnet and will be a primary contractor for the system as well as a customer.

Lightnet is located at 900 Chapel St., New Haven, Conn. 06506.

Bridge Communications unveils gateway for broadband networks

ATLANTA — Bridge Communications, Inc. has announced Gateway Server/6 (GS/6), which allows the interconnection of multiple Ethernet local-area networks over CATV-based broadband networks.

A company spokesman said GS/6 is an internetwork router that permits communications among up to 255 Ethernet networks over a single 6-MHz broadband channel. Communications over the CATV channel is at a signaling rate of up to 2M bit/sec, using a carrier-sense multiple access mechanism.

Reportedly, the GS/6 uses a mid- or high-split, single-cable system, which can be accommodated on spare channels of an existing cable plant, including those from broadband network suppliers such as Ungermann-Bass, Inc. and Sytek, Inc. The unit uses standard CATV-based broadband components such as frequency translators, the vendor said.

The GS/6 features a modular architecture that includes an Ethernet controller card, a Motorola, Inc. 68000-based CPU card executing Xerox Corp. XNS high-level protocols and a High-Level Data Link Control controller card, the company spokesman said.

The GS/6 filters network traffic so messages are sent only to their intended addresses. Ongoing monitoring of the Ethernet/broadband interface is provided by the GS/6, which has a Network Management Facility for traffic statistics, line-error monitoring and remote loop-back diagnostics.

The GS/6 is priced at $10,500, plus a $150 annual license fee for routing software.

Bridge Communications is located at 1345 Shorebird Way, Mountain View, Calif. 94043.

Western Union offers discount

UPPER SADDLE RIVER, N.J. — Western Union Corp. announced recently that users of its Easylink and Telex services can obtain discounts of up to $1,000 per month on its long-distance telephone service.

Business customers will be able to apply 20% of their Easylink bills and/or usage charges for Telex — including Worldwide Telex — as credit to their monthly long-distance telephone charges, the company reported.

The joint-service discount cannot exceed the actual long-distance bill and is applied to the following month's charges. It will reportedly increase customers' savings over AT&T services more than the 25% average presently possible.

More information on the service is available from Western Union at One Lake St., Upper Saddle River, N.J., 07458.

COMMUNICATIONS

VOICE/DATA COMMUNICATIONS

■ **Racal-Milgo, Inc. has added the Communications Management Series (CMS) Matrix Switch, which it purchases from Bytex, to its line of network management and diagnostic control systems.**

The switch is said to provide system redundancy for major network data communications and terminal equipment. Reportedly, in the event that any device fails, the CMS Matrix Switch can restore the network to full operating capacity in seconds by reallocating port assignments from the failed unit to its designated backup.

In its basic configuration, CMS Matrix Switch consists of mainframe units and interface port cards controlled by a single terminal.

Prices for CMS Matrix Switch, scheduled for delivery in April, start at $40,000. Add-on components are priced separately.

Racal Milgo is located at 8600 N.W. 41st St., Miami, Fla. 33166.

■ **GTE Communications Systems Corp. has announced that its GTE Omni PABX (private automatic branch exchange) has been certified as an X.25 interface for use on GTE Telenet Communications Corp.'s packet-switching public data network.**

The Omni PABX is one of 165 X.25 interface products from 110 vendors that have been certified by GTE Telenet. The line is equipped with a dual-bus architecture that permits simultaneous communication over twisted-pair wires. The line is designed for companies with 30 to 1,800 employees.

GTE Communication Systems is located at 2500 W. Utopia Road, Phoenix, Ariz. 85027.

■ **Telematics International, Inc. has introduced Net 25 Interactive Network Facilities (INF), a network control software package designed for the company's Net 25 line of packet switches.**

The package is designed to support a network with one or more network control centers. Network routing tables, node configuration files and software modules are created at the network control center and downloaded to network nodes, the vendor said.

INF's traffic-monitoring facilities provide a central collection point for statistics, alarms and call accounting information. Statistics collected at frame and packet levels are logged to disk for report generation. At the operator's console, real-time data can be displayed. Up to 255 types of alarms can be defined and each one is assigned an alarm group and severity level.

The product's security features include a 16-character user identification code, illegal entry reports and restriction of user access to various capabilities.

Net 25 INF costs $15,000.

Telematics International is located at 1415 N.W. 62nd St., Fort Lauderdale, Fla. 33309.

MULTIPLEXERS/MODEMS

■ **Digital Equipment Corp. has announced Scholar, a synchronous/asynchronous 2.4K bit/sec modem that is said to be AT&T compatible and to adhere to international standards.**

Scholar is said to feature Bell 103, Bell 212A and CCITT V.22 compatibility as well as the international CCITT V.22 BIS standard at 2.4K bit/sec.

The modem can be connected to any workstation via an RS-232C port.

Scholar is priced at $895 and will be available in May.

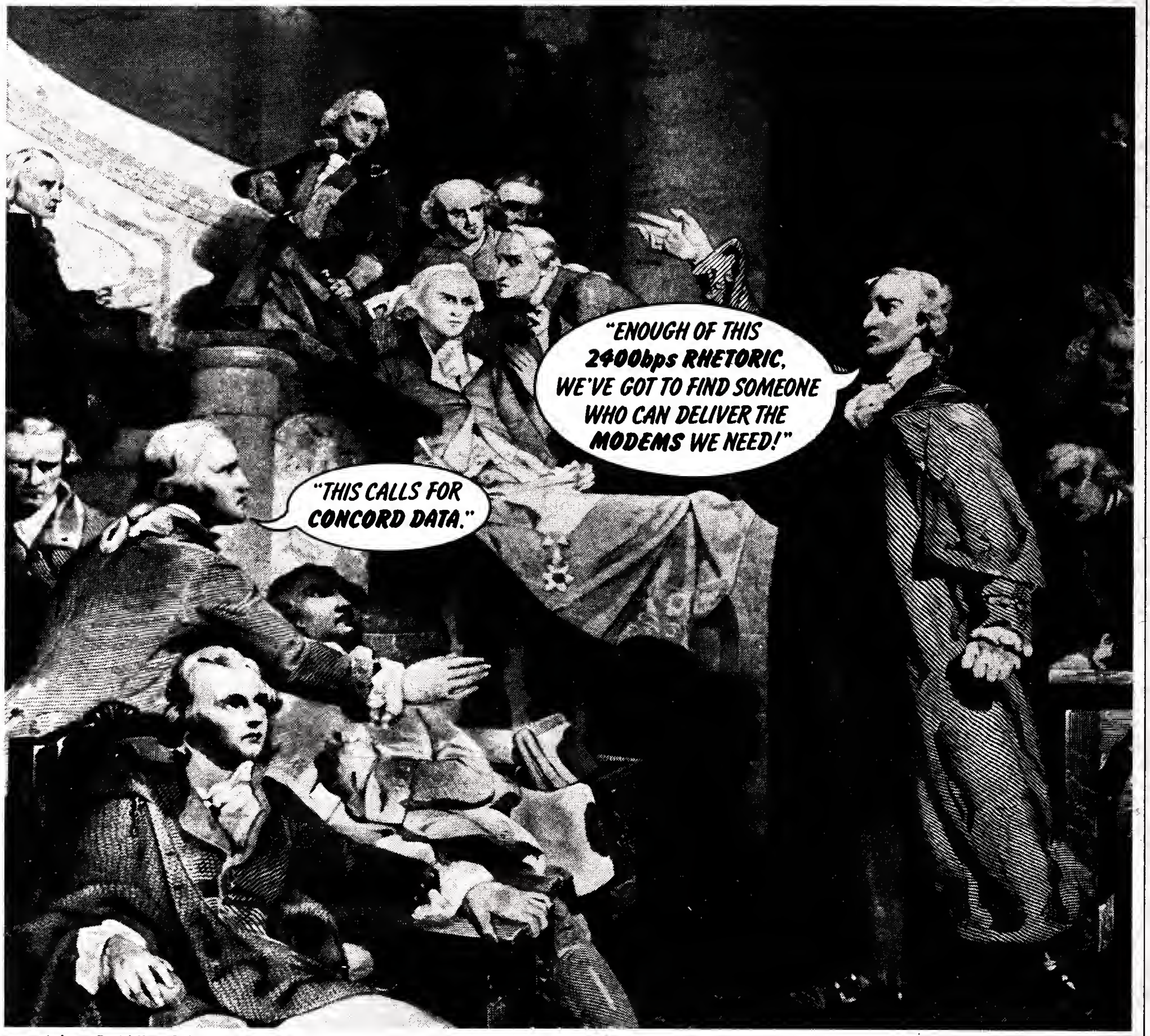
DEC, 146 Main St., Maynard, Mass. 01754.

■ **Datagram Corp. has announced the Steamer data compressor and statistical multiplexer, featuring the company's own compression algorithm.**

A spokesman said Steamer's algorithm is intended to analyze incoming data streams on a port-by-port basis and on a directional basis. Compression ratios average 2.2:1 and 3.2:1.

Steamer is said to be able to compress and/or decompress 3,000 char./sec. The statistical multiplexer routine accommodates data from up to eight asynchronous input channels at speeds up to 9.6K bit/sec. Output data is transmitted in compressed

Continued on page 66


"ENOUGH OF THIS 2400bps RHETORIC, WE'VE GOT TO FIND SOMEONE WHO CAN DELIVER THE MODEMS WE NEED!"
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A. Jones. *Patrick Henry Delivering His Speech at the House of Burgesses.* Courtesy The Bettmann Archive.

There's no argument that in today's business arena, 2400bps full duplex dial modems provide the lowest cost and fastest route to data communications. But of all the modem manufacturers that are promising you great dial line savings, there's only one company delivering the modem products you really need – Concord Data.

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The 5410 is also now available with a white, green or amber Phosphor. No matter which color you choose, your operators will appreciate the crisp, easy-to-read characters. High resolution is maintained even when switching from an 80 to 132 column mode.

Other features that enhance productivity include 8 programmable function keys with matching screen labels; an English option menu; a detachable keyboard that tilts from 5 to 12 degrees and has tactile feedback; standard character sets; and the list goes on and on.

In the interest of operator productivity, write to Teletype Corporation for more information on the 5410 at:
5555 Touhy Ave., Dept. 3223-H, Skokie, IL 60077. Or call
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AT&T
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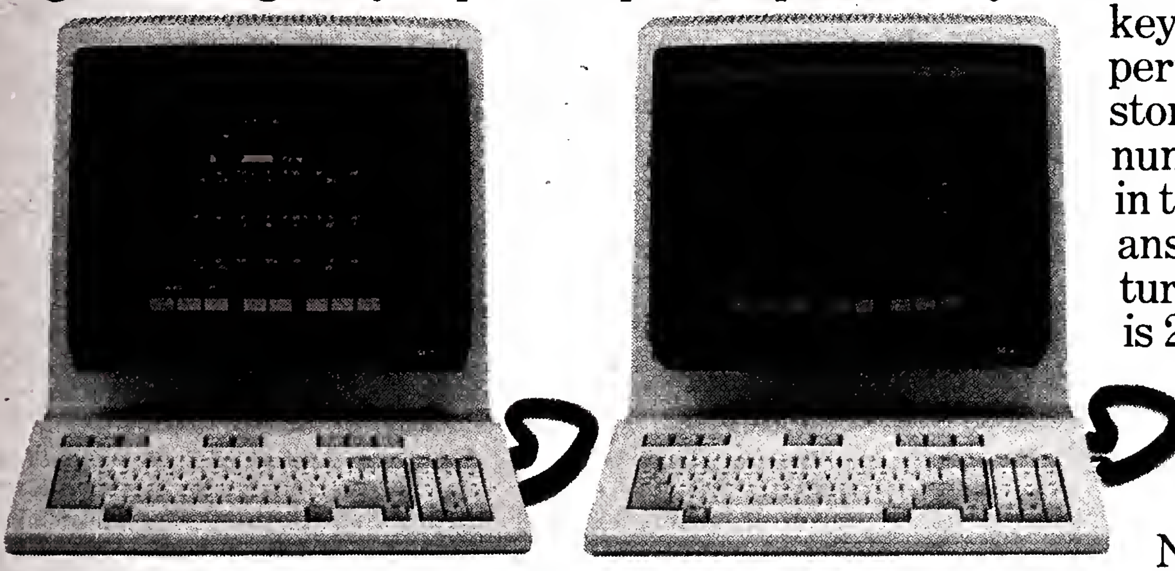

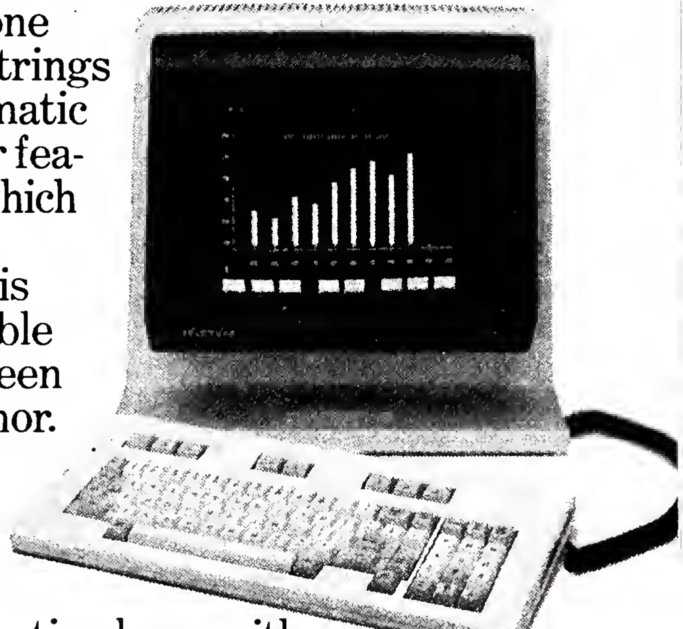

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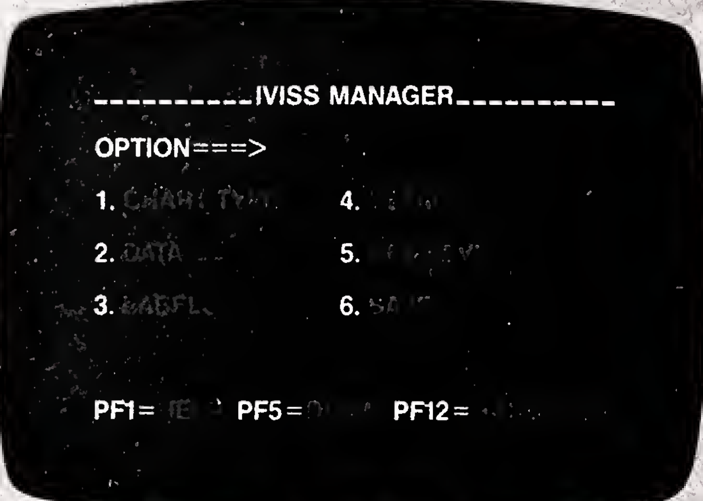

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Continued from page 64

form over a full-duplex link at up to 9.6K bit/sec using the X.25 Level II protocol.

Prices for the three-channel Steamer start at $1,395, and the eight-channel unit with built-in 9.6K bit/sec modem is $4,995.

Datagram, 11 Main St., E. Greenwich, R.I. 02818.

LOCAL-AREA NETWORKS

■ **Network Systems Corp. has announced that its Hyperbus local-area network product line can now be installed with the standard IBM Cabling System.**

A spokesman said the Hyberbus supports both IBM 3270 devices and RS-232 devices. All Hyberbus units delivered since 1983 can function with the new cabling.

With Hyperbus, terminals and workstations are connected in a work area with twisted-pair wire to bus interface units, which are in turn interconnected with a coaxial cable.

Hyperbus prices start at $292.50 per port; no special features or options are required to interface with the IBM Cabling System.

Network Systems, 7600 Boone Ave. N., Minneapolis, Minn. 55428.

■ **Concord Data Systems, Inc. has announced Token/Scope Network Analyzer, a first-level protocol logic analyzer for its IEEE 802.4-compatible Token/Net local network.**

Token/Scope consists of a 5M bit/sec frequency-agile radio frequency modem, access unit and control unit. A network manager controls the network with a Digital Equipment Corp. VT100 or compatible terminal. The product is said to enable network managers to monitor and analyze network performance in real time.

The analyzer features a Command mode from which network managers can select four options: monitor mode, to survey the operation of the token-passing protocol in real time on any broadband channel; trace mode, which records specific network events through user-defined instructions; analyze mode, which displays a chronological record of frames monitored during a trace mode or of lengthy nonframe activities; and the memory option, which allows a user to read frame information stored during trace mode in a Token/Scope card memory queue. Help screens are available for each option.

Token/Scope Network Analyzer costs $30,000.

Concord Data Systems, 303 Bear Hill Road, Waltham, Mass. 02154.

NETWORK SERVICES

■ **AT&T Information Systems recently announced an Access Controller to serve as an interface between the company's Dataphone II, Level 4 System Controller and its Dataphone multiplexers.**

A spokesman said the new product can be used to monitor and control all Dataphone multiplexers. These devices are controlled by System Controller workstations that connect transparently to any port of the Access Controller. The workstation issues commands and receives reports on the status of individual multiplexers and the network as a whole.

Polling commands can be grouped and stored in the Access Controller for immediate execution at a specific time or repeatedly at chosen intervals. Each multiplexer attached to the Access Controller can be addressed with English commands. The Access Controller can monitor from 16 to 240 ports.

The product, scheduled to be available in May, costs $6,085 to $26,200, depending on configuration.

AT&T Information Systems, 100 Southgate Pkwy., Morristown, N.J. 07960.

AT&T

from page 63

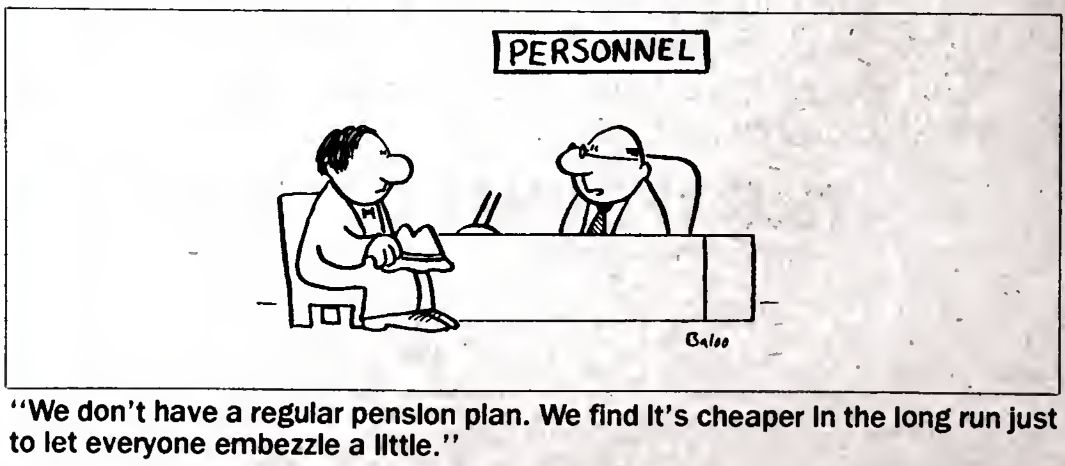
time, the line will drop."

AT&T Communications intends to support DMI in a customer premise-to-network configuration by 1986, Ferguson announced. This would enable customers with DMI-equipped machines to access an AT&T Communications central office switch through Accunet T1.5 facilities, and from there, access on a channel basis any of AT&T Communications' family of digital services. Each of the 23 64K bit/sec channels, for example, could be routed through the company's Dataphone Digital Service to different locations.

To provide this capability, AT&T Communications will have to upgrade its switching facilities to recognize the DMI signaling format, Ferguson said. "To bring Accunet service into our network and then branch it out into other services, we have to provide signaling to those other services," he said. DMI will be supported with Accunet T1.5 as an option.

Support of the DMI bit-oriented signaling format in this application — customer premise-to-network termination — is "a major step in AT&T Communications' plans to support an Integrated Services Digital Networks," Ferguson concluded.

Copies of the technical reference addenda to AT&T Communications' PUB 41460, which details the DMI signaling format, are available for $51, prepaid, from Literary Data Center, Inc., P.O. Box C-9104, Brooklyn, N.Y. 11021.



"We don't have a regular pension plan. We find it's cheaper in the long run just to let everyone embezzle a little."

CANADA

from page 63

Bell Canada is also looking to expand fiber optics into its other services. "Right now we are studying the question of using fiber optics on our long-haul networks," said David Barr, director of planning and standards for Bell Canada's corporate engineering group. "We are also looking seriously at fiber optics for its use in the local loop, particularly to serve large office buildings whose tenants could take advantage of fiber optics' high-volume, high-bandwidth capability."

> "
>
> *Bell Canada has installed more than 20,000 km of fiber-optic cable in its phone net and plans to double that by the end of 1986.*

This is only the beginning. According to Kessler Marketing Intelligence, a research firm in Newport, R.I., the worldwide market for fiber optics reached $761 million last year. Various forecasts indicated that the worldwide market will range between $3 and $6 billion by the end of the decade. And even these numbers may be low. In the U.S. alone, for example, a dozen companies have budgeted $6 billion to be spent over the next four years on long-distance telephone networks.

Projects of similar magnitude are also under way in other parts of the world, especially in Europe and Japan, and a number of intercontinental fiber-optic links are also in the works. Add to that fiber optics' potential in other fields, such as local-area networks, and the growth potential for the market is anybody's guess.

This rapid spread of fiber-optic technology is not surprising when the advantages of the media are compared to conventional technologies. Fiber is extremely accurate, with error rates as low as one error per billion bits. It boasts commercially available transmission speeds in the range of 500M bit/sec, and in laboratory tests that level has been exceeded several times. Because the signal consists of pulses of light, fiber optics is also immune to electrical interference and offers a high level of security.

Further gains are being made as new types of fiber-optic cable are developed. The current trend is toward monomode fiber-optic cable vs. more traditional multimode cable. As their names suggest, the two cables differ in the number of paths they allow a light beam to travel along. Monomode, which permits only one possible beam route, is gaining favor in long-distance networks largely because of potential cost savings. A signal requires less frequent amplification when it only has one path to follow, meaning a monomode network needs fewer signal repeaters along its route. These repeaters represent a major portion of network costs.

If fiber optics still has disadvantages, the most pressing of these occurs when it comes to interfacing with conventional communications systems. A recent report by International Data Corp. (IDC), a Framingham, Mass.-based research firm, pointed out that optical fiber-optic signals must still be converted back to electrical form for amplification.

In addition, the report said, fiber-optic technology still lacks a simple, low-cost method for multiplexing fiber-optic signals. The IDC report predicted that fiber optics will soon surpass microwave in long-haul networks due to its potentially greater carrying capacity.

Even satellite systems will feel the squeeze. IDC said that international telecommunications services are currently split at 40% undersea cable and 60% satellite. By 1993, the report said, the ratio will be 65% undersea to only 35% satellite.

PROBLEM

from page 63

dishes and a local-area network.' Thank-you very much," said Wushow Chou, professor of computer science at North Carolina State University in Raleigh, N.C. "What you are left with is a bunch of buzzwords."

A manager cannot solve problems with buzzwords. And more often than not, the buzzwords do nothing but confuse the issues at hand.

Buzzwords usually connote technologies that may not be widely used today but are expected to be commonplace in the future. Consultants and researchers are fond of buzzwords because buzzwords lend credence to bold predictions. It doesn't matter if the predictions are never realized. In fact, buzzword technologies often never gain widespread acceptance.

Buzzwords can make people sound knowledgeable. A consultant's knowledge, for example, may be limited to theories concerning technical trends rather than encompassing the practical considerations of implementation. That's why consultants often have difficulty answering questions like those posed at the panel session.

Vendors also like buzzwords. Buzzwords let them lump their products, correctly or incorrectly, into one class of equipment. By itself, XYZ Corp.'s 123MDW means little. But when 123MDW becomes an intelligent voice/data private branch exchange, the product gains a measure of credibilty, even if it does not work or does not provide the functions offered by other voice/data PBXs.

Communications managers should not let buzzwords influence purchase decisions because they can mask immature technologies. At Interface, Chou paraphrased John Gantz, editor of the "Tech Street Journal" investment newsletter. "Five years after the trade press and consultants stop talking about a technology, it will actually be implemented," Chou said. Five years may be a conservative estimate. Despite years of talk about local-area networks, they remain an elite technology.

Even the most optimistic research firm predictions estimate that only 16% of all micros will be interconnected with local nets by 1988. By then, talk about local-area networks may have begun to give way to actual implementation of the technology.

Only by experiencing the implementation of new technologies will managers begin to understand their practical considerations.

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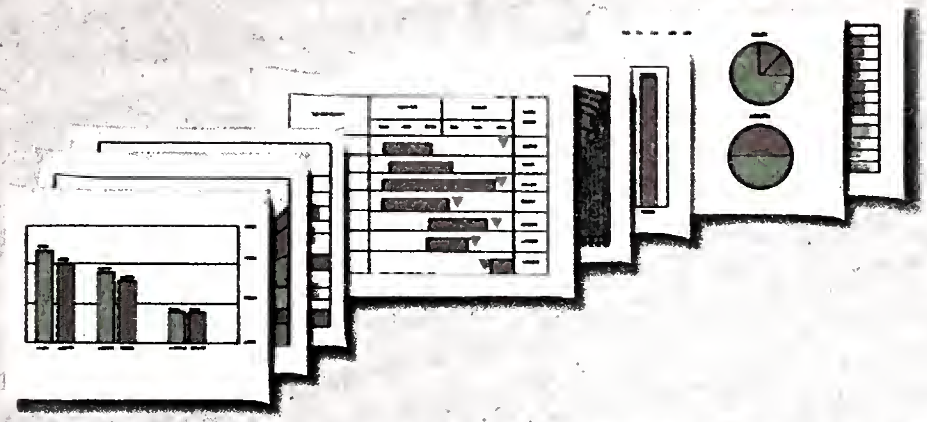

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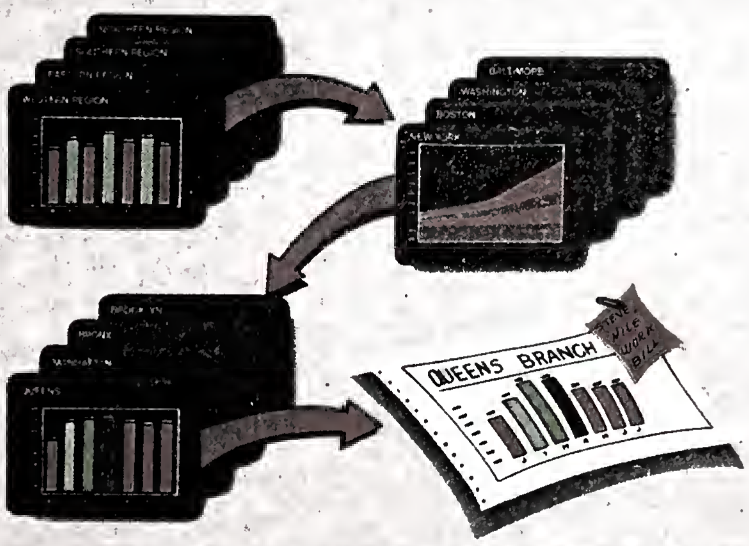

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10. Name the companies that can provide all of the above?

*(Turn Page Upside Down for Answers)

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SYSTEMS & PERIPHERALS

DEC trims memory tab

MAYNARD, Mass. — Digital Equipment Corp. has reduced the add-on memory prices for large-volume buyers of its VAX, PDP-11 Unibus and Q-bus systems using 64K-bit memory chips. The company said it has implemented volume purchase prices for its add-on Unibus memory.

The revised prices apply only to quantities of 200 or more in any combination of eligible products and is therefore geared primarily to OEMs.

If an OEM already has a volume agreement in effect, that customer can purchase annual add-on memory options in small increments throughout the year, according to DEC.

The VAX memory boards for the VAX-11/725, 11/730, 11/750 and 11/780 systems have been dropped from approximately $2,750 per megabyte to $1,650 per megabyte.

Volume purchase prices for add-on Unibus memory have been reduced from approximately $4,900 per megabyte to $2,000 per megabyte.

Selected Q-bus memory prices have been reduced and include the MSV11 (1M byte) Q-bus that was previously $2,800 and is now $1,500, and the MSV11 LF (128K bytes) that was reduced from $1,000 to $450. All of the prices above apply to minimum quantity orders of 200.

No further reductions apply on these items. Similar end-user price cuts have been made for the Q-bus and Unibus, the vendor said.

More information can be obtained from DEC, Maynard, Mass. 01754.

Large WP users get laser printer

CUPERTINO, Calif. — Motorola/Four Phase Systems, Inc. has announced its Model 8165 laser printer as an option to its Series 4000 and 5000 families of office information systems. The printer is geared to users with large word processing requirements, the vendor said.

The 8165 — priced at $39,800 — is a xerographic printer that features 300- by 300-dot resolution and 12 page/min output. Standard features include two 98-char. utility fonts for vertical and horizontal printing and an operator self-test and diagnostic display.

Options include a variety of fonts, a leasing plan for 36 or 45 months and several service programs.

More information is available from Motorola/Four Phase at 10700 N. De Anza Blvd., Cupertino, Calif. 95014.

Datamedia ups 1620 support

NASHUA, N.H. — Datamedia Corp. has announced that its Model 1620 supermicrocomputer is now able to support up to 42 users.

Replacement of the Pick Systems Pick operating system from Version 1.3 to Version 2.0 — along with the 2M-byte memory board the company announced in January and the Model 1620's 2K-byte memory cache — allows the system to support up to 42 users, the vendor said.

Datamedia said that it will provide Version 2.0 of the operating system free of charge to the company's existing customers.

A 2M-byte 42-user Model 1620 Supermicro configured with the Pick operating system costs $36,400.

More information is available from Datamedia, 491 Amherst St., Nashua, N.H. 03063.

HARDTALK
Kathleen Sullivan
CW West Coast Bureau

Altos 3068 carving niche

With the introduction of the newest member of its multiuser microcomputer family — the Altos 3068, a 30-user system built around Motorola, Inc.'s 68020 microprocessor — Altos Computer Systems, Inc. appears to be trying to establish itself on the upper tier of an emerging class of computer systems based on microprocessors. The Altos 3068, however, is capable of a performance that rivals large minicomputers.

Although many supermicrocomputer vendors have set their sights on the traditional minicomputer marketplace, Altos, one of the first companies to use the 68020, appears to have managed to scrape its way to the top of the heap, at least temporarily.

Jim Renalds, a senior analyst at Dataquest, Inc., a San Jose, Calif.-based market research firm, said, after evaluating a preview model of the system, that he accepts Altos' contention that the Altos 3068 can match the performance of a Digital Equipment Corp. VAX-11/780. The Altos 3068, he said, gains much of its performance capability from its architecture, which is based on a state-of-the-art microprocessor with a proprietary bus structure.

Scheduled for shipment this summer, the Altos 3068 will probably strengthen the company's position in the multiuser microcomputer market, Renalds said. "Altos has really brought to market a

See **ALTOS** page 76

■ Raster Technologies and Boston's Computer Museum are sponsoring a contest for graphics artists/**70**

■ Acctex Information Systems unveiled a turnkey document storage and retrieval and storage system/**70**

INSIDE

Turnkey Systems/**70**
Data Storage/**70**
Terminals/**70**
Printers/Plotters/**72**

Report targets systems capacity

DP execs urged to adopt work load forecasting program

WASHINGTON, D.C. — Systems capacity forecasting is playing an increasingly important role in the life-cycle management of data processing systems and should become an ongoing process in most shops.

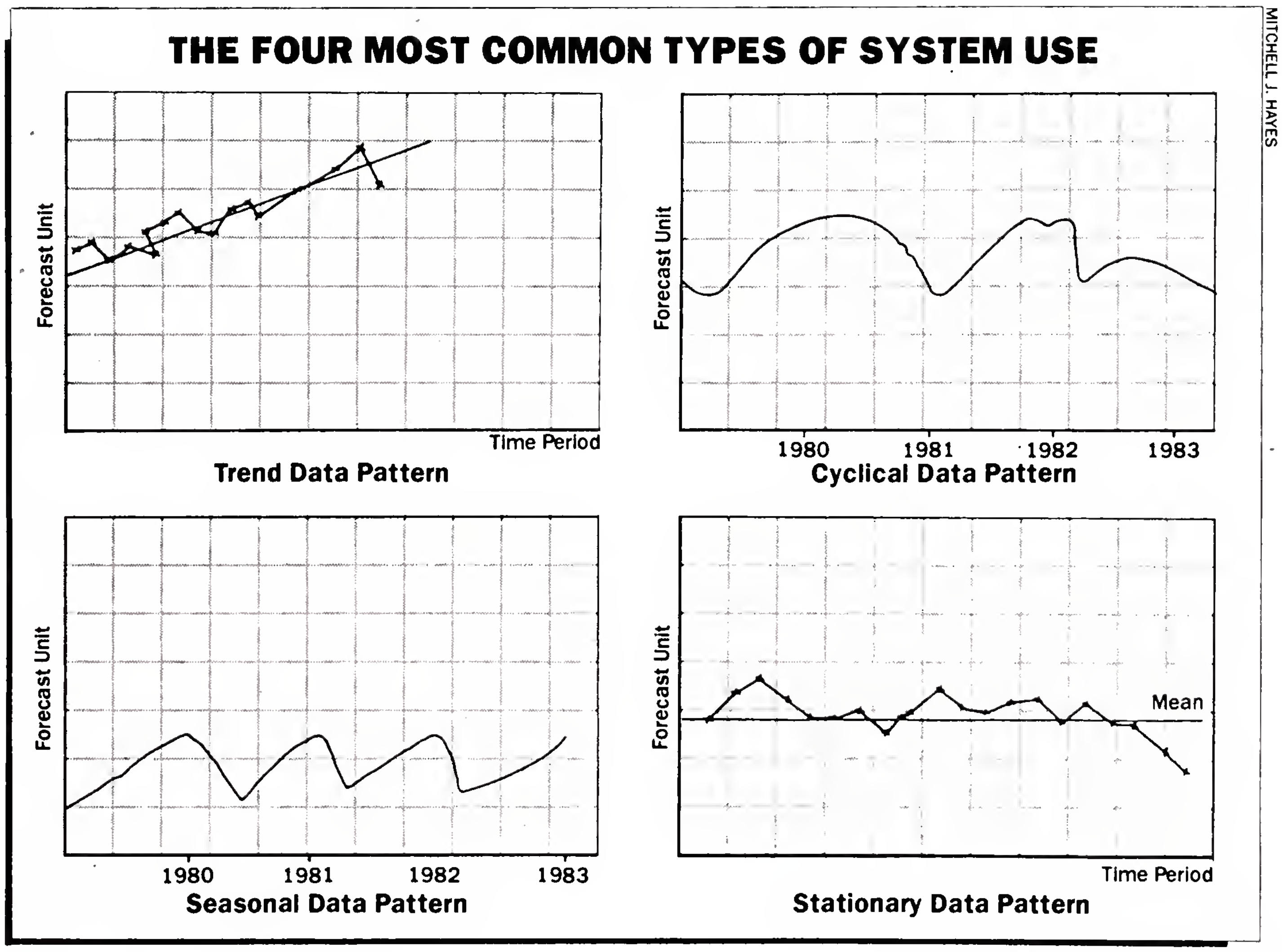
This is the finding of recent report issued by the National Bureau of Standards called "Guide on Work Load Forecasting." The report contends that DP managers should start a capacity forecasting program with an analysis of historical data and collection of future requirements.

Several steps can aid DP executives in performing effective work load forecasting. These include the following:

- Identifying the forecasting objectives.
- Organizing a forecasting team.
- Collecting data by work load levels.
- Analyzing historical data.

It is necessary to assess systems work load on different levels. For example, a work load can be

See **FORECAST** page 76



THE FOUR MOST COMMON TYPES OF SYSTEM USE

MITCHELL J. HAYES

SOURCE: NATIONAL BUREAU OF STANDARDS

Computer museum, graphics firm to sponsor contest

NORTH BILLERICA, Mass. — Raster Technologies, Inc. and Boston's Computer Museum are jointly sponsoring a contest for developers of computer-generated graphics images.

Called the First Annual International Computer Graphics Image Contest, the competition is offering a $2,000 grand prize for the most creative, unique and visually appealing graphics image entered. Awards of $1,000, $500 and $200 will also be offered for runners-up, according to Raster Technologies.

Entries should be submitted in a 35mm color slide format; two slides per entry must be included. Submissions must be received by Raster Technologies by May 30, and all entries must contain identifying information that will allow the judges to determine the source of the entry. Winners will be announced July 23 at the Raster Technologies booth at Siggraph '85 in San Francisco. The winning entries will be displayed at the Computer Museum after Aug. 1, Raster Technologies said.

Professional, student categories

There are two entry categories for professionals (those currently employed and working on a computer graphics system) and a student category (for those currently enrolled full-time at an accredited college or university), the company said.

Entries will be judged by a panel of computer graphics designers including Alan Barr, associate professor of computer science at the California Institute of Technology; Alyce Kapro, a computer graphics consultant; Oliver Strimpel, associate director and curator of the Computer Museum; and Andries van Dam, chairman and professor of the computer science department at Brown University in Providence, R.I.

For more information, or to submit entries, contact the First Annual International Computer Graphics Image Contest, c/o Raster Technologies, Nine Executive Park Drive, North Billerica, Mass. 01862.

TURNKEY SYSTEMS

■ **Acctex Information Systems (AIS) has released a turnkey document storage and retrieval system that incorporates an IBM Personal Computer, AIS' Find search and retrieve software and a micrographics reader/printer.**

Find was written to provide modular growth from a single personal computer-based system to large-scale turnkey document image management systems controlling a combination of micrographics and optical disk media. Prices start at $35,000.

AIS, Suite 600, 131 Steuart Street, San Francisco, Calif. 94105.

DATA STORAGE

■ **Motorola/Four Phase Systems, Inc. has introduced a 300M-byte hard disk drive that doubles the maximum disk storage for the company's Series 4000 and Series 5000 office information systems.**

The DD350 is a rack-mounted drive with 276M bytes of formatted storage capacity. Up to four drives may be used for a capacity of 1,104M bytes. A Four Phase NP/80 intelligent disk controller is required to add the drive to the 4000 or 5000.

The price of the DD350 disk is $32,000 with volume discounts available. The required NP/80 disk controller costs $10,750.

Motorola/Four Phase Systems, 10700 N. De Anza Blvd., Cupertino, Calif. 95014.

■ **American Digital Corp. has announced two disk drives for the firm's System 73-1 minicomputers.**

A Data Products, Inc. Cipher group code recording Cachetape ½-in. tape drive provides up to 180M bytes of storage per reel to back up large Winchester disk drives.

Also available is Fujitsu America, Inc.'s Eagle 10½-in. Winchester-type fixed disk drive with 474M-byte capacity and 18-msec positioning time. As an update to the System 73-1, the price of the Cipher group code recording Cachetape is $4,900. The Fujitsu drive costs $6,600.

American Digital, 3525 W. Peterson, Chicago, Ill. 60659.

■ **Zetaco, Inc. has introduced its Model MZT-3 magnetic tape coupler that interfaces half-line formatted tape drives with Texas Instruments, Inc. BS600 and BS800 minicomputers.**

The MZT-3 supports data transfer rates of up to 1M byte/sec and uses electronically erasable programmable read-only memory technology to replace on-board switches. The MZT-3 reportedly supports up to four tape drives, including any mix of start/stop, streaming, cache, group coded recording and tridensity.

The MZT-3 Tape Coupler consists of a coupler, one set of tape cables, diagnostic software, a streaming utility and complete documentation and costs $1,675.

Zetaco, 6850 Shady Oak Road, Eden Prairie, Minn. 55344.

TERMINALS

■ **ITT Courier Terminal Systems has introduced its ITT 1778, an IBM 3270-compatible display terminal that attaches directly to IBM 3274 and 3276 controller ports.**

The 1778 has a 12-in. monitor, green or amber screens and a choice of three keyboards — a 92-key data entry format, a typewriter format and a typewriter format with numeric keypad. It costs $1,550 for the green monitor with keyboard, and $1,600 for the amber monitor with keyboard.

ITT Courier Terminal Systems, 1515 W. 14th St., Tempe, Ariz. 85281.

■ **Innovative Electronics, Inc. has announced its Transactor industrial bar code data-entry terminal which works with the firm's Netmaster central control unit and Factory Data Collection system.**

Information gathered by the Transactor terminal can be on-line to the host computer or stored in the Netmaster for later use and report generation. The user may download files to the Netmaster from the host for validation purposes.

The terminal is connected to the Netmaster via RS-422 multidropped polled communications. It is equipped with a 16-char. alphanumeric display and a bar code wand. A laser scanner is optional.

Transactor costs $1,250, the vendor said.

Innovative Electronics, 4714 N.W. 165th St., Miami, Fla. 33014.

■ **Lee Data Corp. has unveiled its Model 2130 color display unit which is compatible with IBM's 3179 display.**

The Model 2130 includes a 14-in.

Continued on page 72

Uptime

Provide 24 hour CICS access

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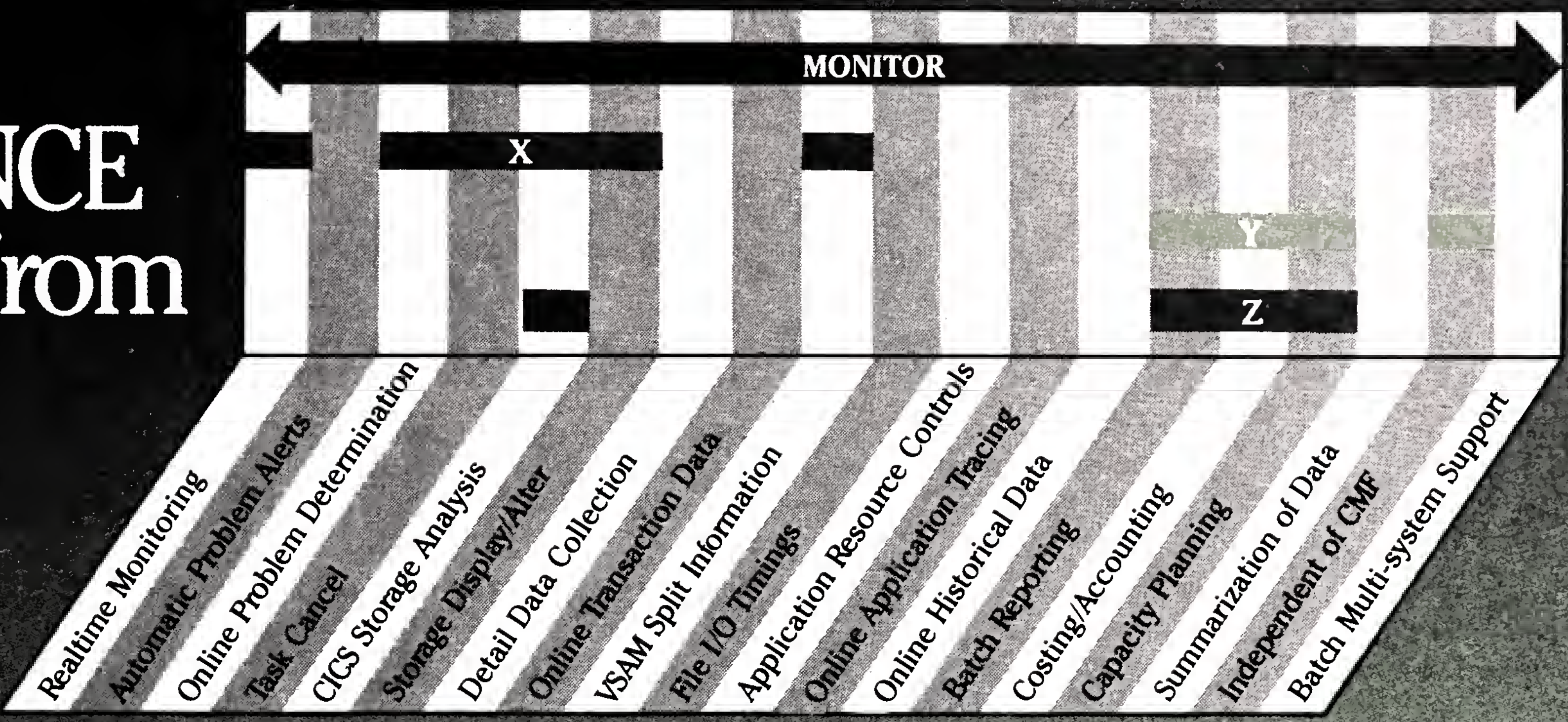

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Continued from page 70

monitor, 122-key keyboard and logic module. It operates in either on-line or local-command modes. In on-line mode, the display will support host applications requiring up to seven colors. In the local-command mode, users may select two- or four-color support.

The unit costs $2,066 and will be available this month.

Lee Data, 7075 Flying Cloud Drive, Minneapolis, Minn. 55344.

■ **Electrohome Ltd. has introduced two special-purpose color data display monitors that were designed for desktop computers, public information display systems, stock exchange display and educational applications.**

The ECD 1904 is a 19-in. unit with .53mm dot pitch and 80-char., 560-pixel by 240-line resolution. The ECD 2504 is a 25-in. unit with .84mm dot pitch and an 80-char., 560-pixel by 40-line resolution.

The monitors are compatible with the IBM Personal Computer and with U.S and European red-green-blue standards, the vendor said.

The U.S. prices for the units are approximately $985 for the 1904 and $1,150 for the 2504. They will be available in late April.

Electrohome, 809 Wellington St. N., Kitchener, Ont., Canada N2G 4J6.

■ **Chromatics, Inc. has announced six peripherals for its CX 1500 Colorgraphic Display System: a digitizer, a mouse, a light pen, a trackball, a function switchbox and bezel switches.**

The X-Y Digitizer is a 16-in. by 16.2-in. tablet with an 11.7 sq.-in. active flat white matte surface. It has a four-color coded button puck that can select and position objects on the screen or from a menu, the vendor said. The digitizer costs $2,895.

A nonmechanical, optical mouse includes three buttons for input selection and a 9-in. by 11-in. mouse-pad surface. It is supported by firmware supplied in the CX 1500 Workstation and in all Graphical Kernel System (GKS) host library options. One mouse costs $595.

The CX Light Pen is said to allow user input of screen coordinates by pointing the pen at an illuminated area of the screen. It can be used as a logical input device in GKS programs, the vendor said. The light pen costs $995.

The trackball reportedly allows user input of positioning information for user feedback. It features three momentary action switches with red LEDs, quadrature outputs, a peripheral processor and cast-aluminum housing, the vendor said. The trackball generates 200 ball-revolution/min at 192 pulse/revolution. It costs $2,995.

A 24-function switchbox has lamped programmable switches that allow input of frequently used user-defined character strings with a single keystroke, the vendor said. GKS support reportedly allows use of this feature as a logical input device in GKS programs. The switchbox, including a snap-in overlay, costs $2,995.

Bezel switches are said to allow choice of a user-displayed menu or input frequently used, user-defined character strings with a single keystroke. GKS support reportedly allows the switch to be used as a logical input device in GKS programs. The switch consists of an eight-function switch printed-circuit board, bezel modifications and mounting panel. One switch costs $295.

Chromatics, 2558 Mountain Industrial Blvd., Tucker, Ga. 30084.

■ **Televideo Systems, Inc. has unveiled its Model 955 Ascii VDT, which was designed for office automation applications.**

The terminal features a 14-in., 80- by 132-col. display. It has up to four pages of memory in both 80- and 132-col. mode.

The 955 terminal costs $699 and is scheduled to be available for shipment this month.

Televideo Systems, 550 E. Brokaw Road, San Jose, Calif. 95112.

■ **Lear Siegler, Inc. has unwrapped its ADM 12 Plus editing terminal, which is compatible with its ADM 2, ADM 12 and ADM 31 terminals and the Televideo Systems, Inc. 925, 950, 912 and 920 terminals.**

The ADM 12 Plus features an 80- or 132-col. display, programmable cursor keys, a variable format display memory, variable-speed vertical scrolling and horizontal scrolling. It provides two pages of 80- or 132-col. by 24-line display memory or a choice of wide and long page memory configurations.

A four-page memory option is available to double the standard memory formats and add a 158-col. by 48-line display memory format. The terminal includes 16 programmable function keys.

The ADM 12 Plus costs $745.

Lear Siegler, 901 E. Ball Road, Anaheim, Calif. 92805.

PRINTERS/ PLOTTERS

■ **Datasouth Computer Corp. has released its TX5220 bidirectional multimode printer for the IBM System/34, 36 and 38.**

The TX5220 is said to emulate the IBM 5256, 5224 and 5225 printer series and interfaces directly to the IBM systems via a standard twin-axial cable in its back panel. It does not require an external protocol conversion box, the vendor said.

The printer can be used as an intermediate or terminating printer on a chain of up to seven devices. It also has a Centronics Data Computer Corp.-compatible parallel interface for use as a shared printer on an Ascii system, according to the vendor.

Features include 220 char./sec printing in draft mode, 90 char./sec in memo mode and 40 char./sec in near-letter-quality mode, as well as dot-addressable graphics.

The TX5220 costs $3,495.

Datasouth Computer, 4216 Stuart Andrew Blvd., Charlotte, N.C. 28210.

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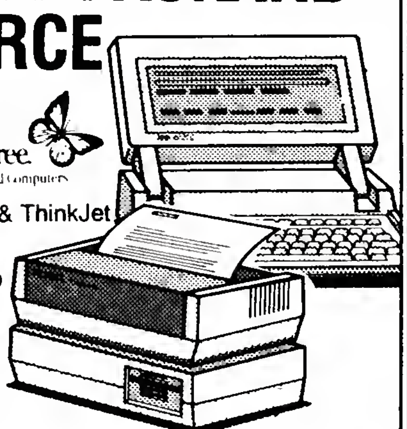

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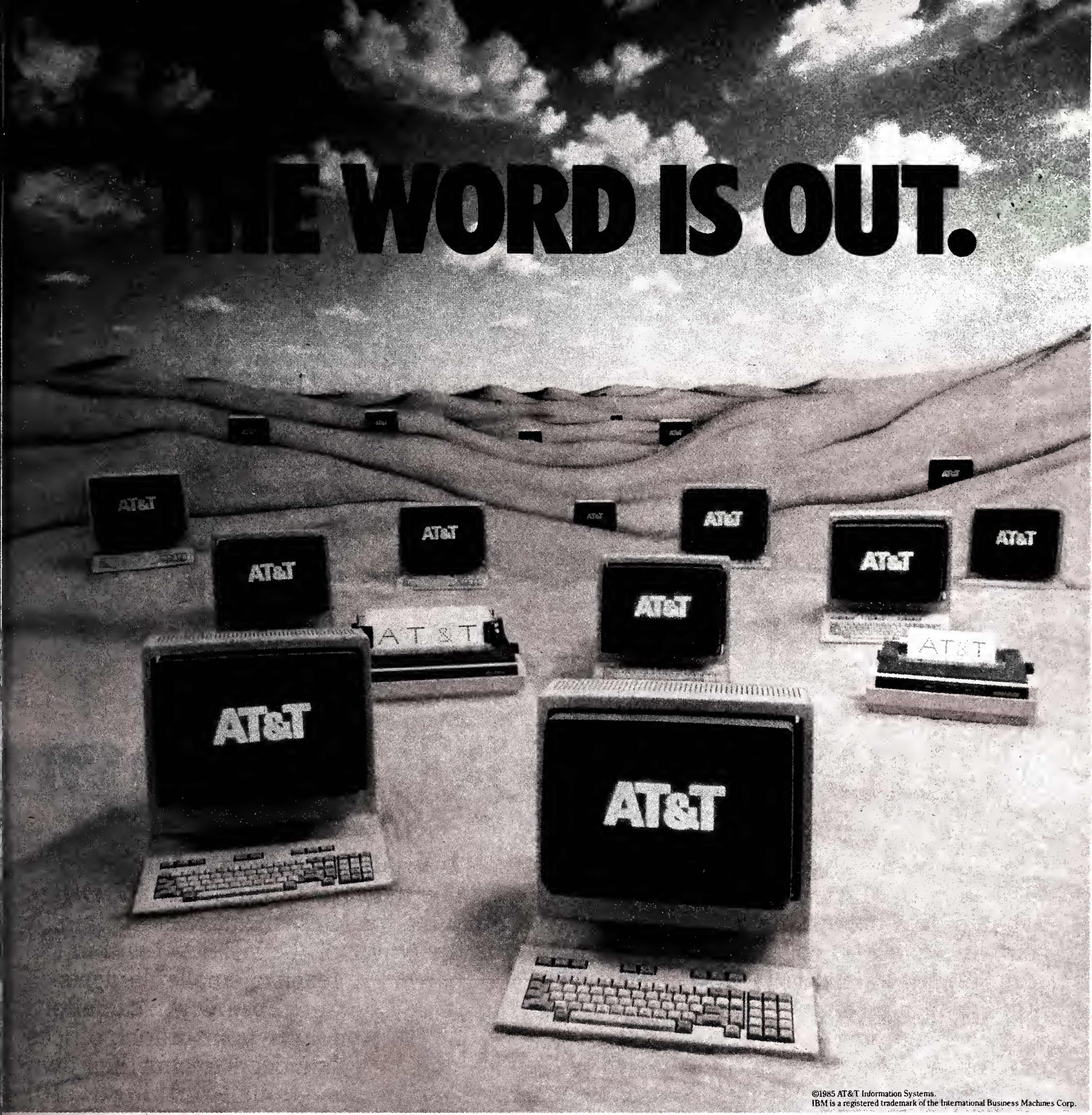

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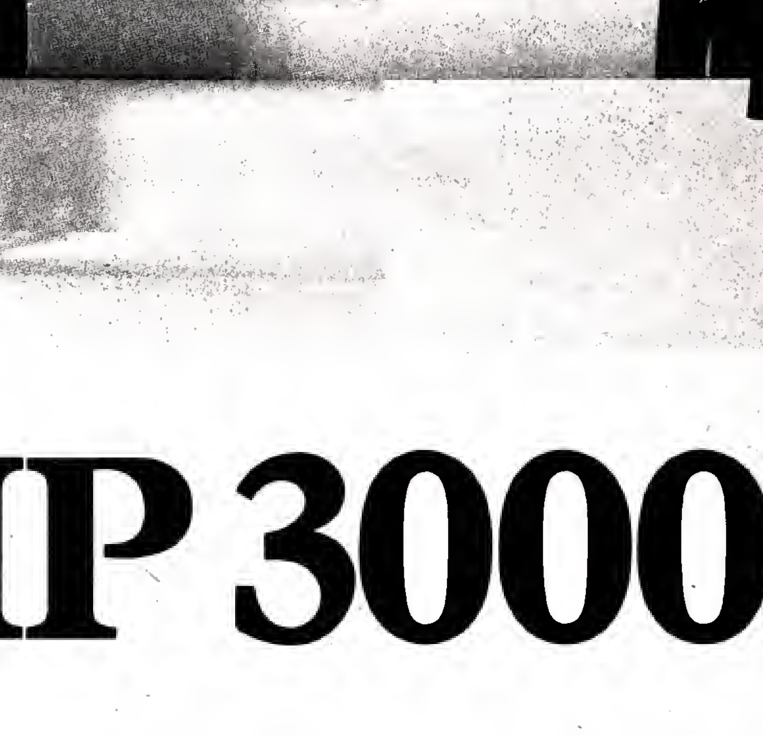

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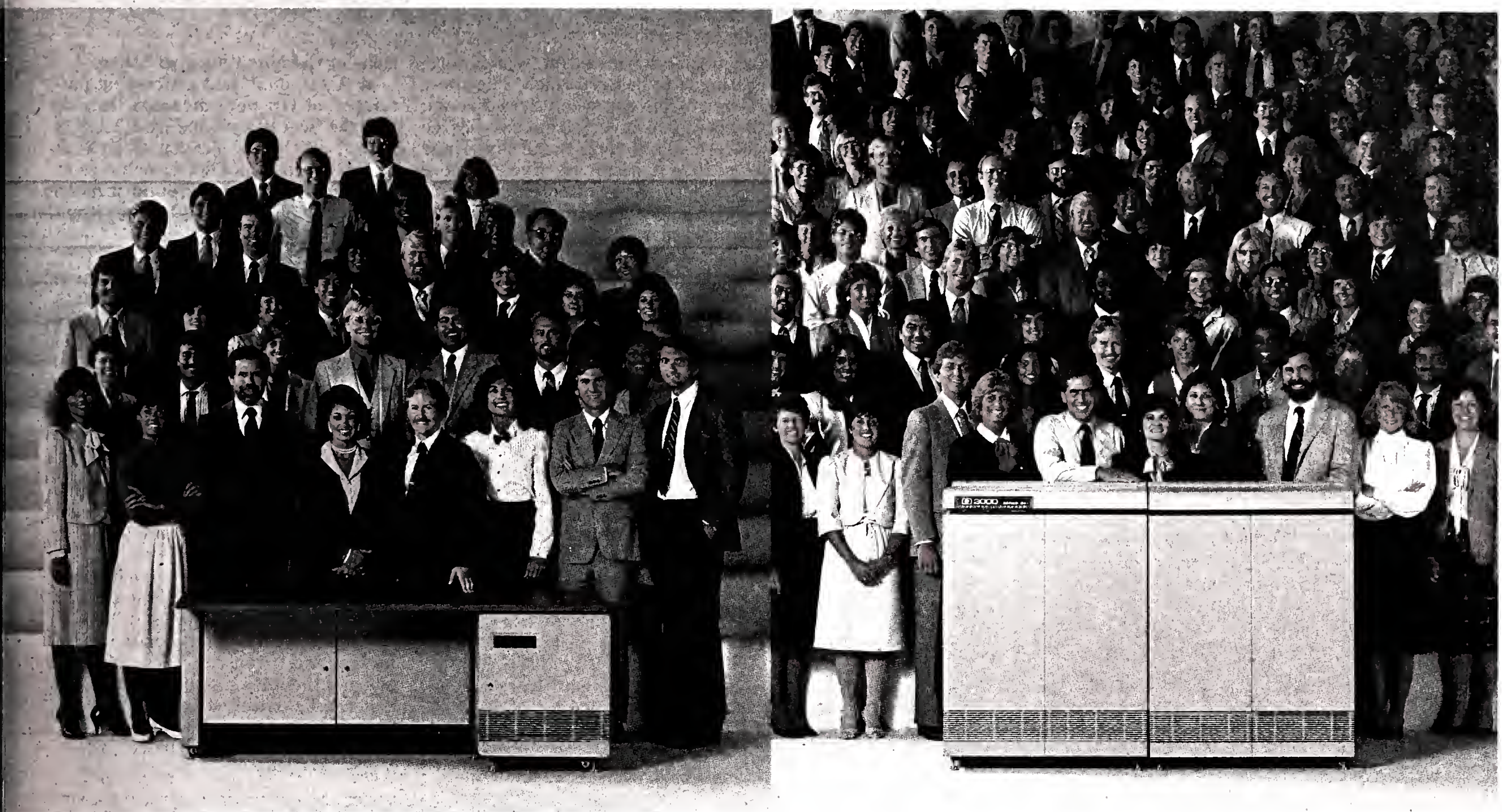

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FORECAST

from page 69

described by its mission, its functions, quantifiable events, DP operations, DP resource usage and DP plans. Each of these work load levels can be associated with different levels of management and/or users. Evaluation of the DP operation at the various levels will provide the necessary input for translating mission requirements into DP resource needs, the report said.

After work load data has been collected from the different levels, the forecaster must analyze the data with regard to applications systems and total work load, the report said.

The analysis of historical data by applications systems can reveal important information necessary to build a model that will be used to forecast a given applications system. For example, historical data from different levels can be plotted using simple histograms and scatter diagrams.

Choosing a technique

Upon completion of the preliminary steps to forcasting, DP executives should select a forecasting technique. The most commonly used techniques include the following:

- Simple moving averages.
- Exponential smoothing.
- Classical decomposition.
- Simple linear regression.
- Multiple linear regression.
- The Box-Jenkins method — considering data availability and the pattern of the historical data, accuracy vs. cost of using the technique and desired forecast span, the report said.

Forecast spans should be broken down into short-, medium- and long-range time horizons for which forecasting is to be performed. The short range is from one week to two years; the medium range is from two to five years; and the long range is defined as a time horizon of five or more years, according to the report.

With the exception of the Box-Jenkins forecasting technique, all other techniques assume that one of four underlying patterns can be identified in the historical data. These general trends are as follows:

- The trend data pattern, when the work load increases as a result of changes in the way the existing system is used. This includes, for example, an increase in the number of transactions processed by the system or in program development.
- A cyclical data pattern that can be caused by a system change, such as the introduction of new applications or the elimination of others.
- A seasonal data processing pattern caused by periodic tasks that affect the overall systems work load.
- A stationary data pattern that occurs when a time series behaves as random fluctuations around a mean value, and no trend can be identified.

Analyzing results

The forecaster should build a model using part of the historical data and then exercise the model on the remaining data to show how the forecast values compare with the actual values, the report said.

The results of the forecasting process need to be analyzed carefully and evaluated before any decisions can be made based on the them. The results present decision makers with information on whether adequate computer resources are available to perform the users' work load.

The "Guide on Work Load Forecasting of the Computer Science and Technology" series (S/N 003-003-02634-4), which gives examples of forecasting using the various methods and includes a suggested reading list, can be obtained for $3 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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ALTOS

from page 69

system that will set a lot of the industry on its ear," he predicted.

Tim Bajarin, vice-president of microcomputer research at Creative Strategies, Inc., a market research firm also located in San Jose, agreed with Renalds. Altos is "way ahead of everybody else" with the release of the Altos 3068, Bajarin said, noting that the system's modular design offers users a flexibility that few other companies can match. "The system has tremendous potential," he said.

In the Altos 3068, up to eight specially designed boards can be inserted into the chassis, with each board serving a distinct function. In a standard configuration, a system would include a CPU board, a random-access memory board, two file processor subsystem boards and a serial communications board.

"It uses plug-in boards the way a personal computer does," Bajarin said. "That really sets them apart."

He agreed with Renalds that the Altos 3068 strengthens the company's stand in the multiuser microcomputer market. Altos has already established itself as a company that offers quality and service with its current family of multiuser systems, based on Intel Corp. microprocessors, Bajarin said. Now, he noted, it will be able to offer its customers an upgrade path to a system based on a true 32-bit microprocessor.

Bajarin also applauded Altos' selection of AT&T's Unix System V operating system, noting that System V is on its way to becoming the standard in the Unix market.

Both analysts praised the Altos 3068's remote diagnostics software, which is available as an option on the system. "Most multiuser microcomputer companies don't have remote diagnostics," Renalds noted. "That's much more typical in the minicomputer or mainframe market."

Neither analyst thought Altos would encounter problems getting an adequate supply of the Motorola microprocessors for the system.

COMPUTER INDUSTRY

Wang girds for offensive

Planning product bows despite downturn

By Peter Bartolik
CW Staff

BOSTON — Wang Laboratories, Inc. believes the industrywide slowdown in orders growth could last up to a year, but despite that, the company intends to make aggressive product announcements over the next few months, senior executives said recently.

Wang recently projected 10% growth for the third quarter ended March 31 and a decline in profits for the fourth quarter and fiscal year that ends June 30; the company also confirmed it plans a two-week production shutdown in July [CW, March 25]. It was also reported that top executives had agreed to a 10% pay cut.

Claiming that Wang's problems are symptomatic of an industrywide slowdown, John Cunningham, president and chief executive officer of the office automation leader, said, "I don't think it's a three-month phenomenon, but I also don't think it's a two-year phenomenon." He said the slowdown, which other vendors have acknowledged, could extend for nine to 12 months.

Speaking here at a press briefing, Cunningham and other Wang executives conceded that delays in shipping Wang Office software products contributed to the drastic downturn in Wang's fortunes from its historic 30% growth rate. "I think if we had done a better internal job, we would be feeling this not as much," Cunningham said.

He added that Wang will attack the general slowdown as an internal problem and will make its operations more efficient. During the current fiscal year that ends in June, he said, Wang will have hired only about 1,000 employees, down from the original goal of hiring 4,000.

Fred Wang, executive vice-president and chief development officer, said the delay in shipping Wang Office resulted from the complexity and scope of the project. "The magnitude of the project just continued to grow," Wang said. "The architecture was the right one, but there was just a

See **WANG** page 84

Datapoint to hinge sale on users' needs

By Peter Bartolik
CW Staff

SAN ANTONIO — With the battle for management control decided, Datapoint Corp. will move toward liquidation in a manner designed to ensure that its "customers are provided with the best of products and services," officials said recently.

A week after the company negotiated a conditional surrender with arbitrageur Asher B. Edelman [CW, March 25], the top executives of the company mailed out a letter to customers pledging that the liquidation effort will be "designed to satisfy our customers and strengthen our products and services." The letter was signed by Edelman, who was named chairman as part of the settlement, and Edward P. Gistaro, the company president and former chief operating officer who assumed the title of chief executive officer from resigned Chairman Harold E. O'Kelley.

In an interview with *Computerworld,* Gistaro stressed that Datapoint will not sell off its various operating divisions in a piecemeal manner. What has been holding up the sale of its manufacturing and service operations, he said, is that "we haven't been able yet to put together an ongoing business relationship between the potential buyers."

Edelman and the company have said they hope to sell off the service operations for $200 million and the manufacturing operations, which produce distributed data processing and office automation equipment and networks, for $100 million.

Gistaro said he met with Edelman and was convinced the arbitrageur is committed to meeting the best interests of the customers and recognizes the value of the company's relationships with customers. "That's the only reason I'm with the company," Gistaro said, adding that he antici-

See **DATAPOINT** page 84

- ■ Eastman Kodak recently announced another computer industry acquisition, and archrival Polaroid didn't sit still/**82**
- ■ Another IBM executive was moved recently, as the reshuffle of Big Blue's information systems group continued to reverberate/**84**

IPL blames 1984 revenue losses on shipping delays, market lag

WALTHAM, Mass. — IPL Systems, Inc. recently reported a net loss of $11.9 million, or $2.38 per share, on revenue of $4.6 million for fiscal 1984, which ended in December.

In 1983, the midrange plug-compatible mainframe vendor posted a loss of $4.2 million, or 85 cents per share, on revenue of $9.9 million.

In the fourth quarter of 1984, IPL experienced a net loss of $5.1 million, or $1.03 per share, on revenue of $1.3 million. A year earlier, the company had reported a loss of $2.5 million, or 51 cents per share, on revenue of $2.2 million.

According to IPL, the 1984 results were adversely affected by several factors, including depressed prices in the midrange mainframe computer market, delays in the shipment of its IPL Model 4480 and the provision of significant reserves against inventories.

The company said that cost-cutting measures implemented during the year enabled it to increase its cash balance to $3.9 million in the fourth quarter.

Press conference gaffe raises questions of credibility

INDUSTRY INSIGHT
Peter Bartolik
CW Senior Editor

On a recent Tuesday, Wang Laboratories, Inc. held what seemed to be a comprehensive press briefing to go over the company's business and product strategy. The reason for the briefing, top executives said, was that Wang felt it needed to do a better job communicating with the press.

The following day, Wang confirmed that just the previous week it had told production employees to take vacations or unpaid leaves during the first two weeks of July for a companywide production shutdown (see related story above). Asked why no mention of the shutdown was made during the press briefing, a Wang spokesman lamely replied that the company considered the issue "an employee communication."

Submitted for your consideration (fade in: theme music from the *Twilight Zone)* is a classic example of a credibility gap in the making.

Several months ago during a non-industry-related meeting in Boston, according to one person who was there, Wang President John Cunningham was discussing the company's phenomenal 30% growth rate, which had not yet declined to the 10% rate the firm expects to record for the quarter that ended in March. Noting that most of Wang's competitors had at one time or another suffered setbacks in business goals, Cunningham reportedly told the audience, "I feel like the last virgin."

That phrase points out what some industry analysts believe is a potentially significant shortcoming on Wang's ledger books: The company has never before had to deal with adversity.

Right now, the company is in the throes of adversity; a Boston newspaper even reported that a senior management team at Wang is evaluating a number of cost-cutting measures, including layoffs.

During the press briefing, Cunningham noted that there is little Wang can do to counter the extremely negative impact of the strong dollar in international currency markets. The challenge, he said, is how the company manages its business during this difficult period.

Right now, crisis management is the key issue for Wang. The company is at a turning point in its history. No longer able or content to live off its famed word processing base, it can only prosper by moving ahead with new technological solutions to defend its office automation base from the invasion of the Big Blue sales hordes.

Wang has taken an aggressive stance. A current print advertising campaign has unabashedly taken potshots at IBM, and the advertising effort has moved to television in some areas with high-priced, high-impact fusillades directed against the moral integrity of IBM.

Although that campaign is applauded in this corner for its directness and mass appeal, advertising alone is not sufficient to move the company forward. The sympathy bought with millions of advertising dollars can vanish overnight in the light of negative news stories. The fact is that Wang has a lot more to lose than most of its competitors during the current industry downturn. Above all, it needs to establish credibility by taking a proactive stance during an adverse period.

By neglecting to mention a scheduled production shutdown, Wang has indicated that, at this point, it is attempting to bar the doors against bad news. That can produce a shelter mentality, something that breeds nasty surprises.

Investors seek to scoop up shares of Wall Street darlings

OUTSIDE LINES
Bohdan Szuprowicz

Institutional investors are constantly on the prowl for undiscovered high-technology companies whose stock prices will appreciate to reflect their rapid growth in revenue and earnings.

When institutions collectively acquire 20%, 30% or more of the outstanding shares of such companies, these become the darlings of Wall Street. Their prices may appreciate rapidly as even more institutions rush in to get a piece of the action.

By the same token, when the stock of these companies falls out of favor, institutions eliminate these positions from their portfolios, which results in dramatic price drops of those shares.

During the last two years, 21st Century Research has been keeping track of changes in institutional ownership of approximately 200 stocks of some of the fastest growing and most popular high-technology companies. An analysis of those changes during the 12-month period from January 1984 to January 1985 yields some fascinating results indicating which stocks are on their way to becoming the new darlings of the institutions and which ones are definitely falling out of favor.

For example, Valid Logic Systems, Inc., supplier of computer-aided engineering systems for custom design of complex microchips, went public in October 1983, and by February 1984, Standard & Poor's Corp. reported that 0.11% of its stock was acquired by institutions. A month later, 6% of that stock was owned by institutions, and by January 1985, almost 21% ended up in institutional portfolios. Institutions increased their ownership of Valid Logic at an average monthly rate of 1,895%.

On the other hand, Tandon Corp., the minifloppy leader long standing as an institutional darling with more than 59% of its outstanding shares in institutional portfolios, reported that it had been dumped consistently throughout last year at a rate of 2.6% every month. It also reported that by January 1985, only 40% was left in institutional portfolios.

IBM is the bellwether of high-technology stock, and more than 50% of its stock is in the portfolios of more than 1,600 institutions at all times. IBM has the most widely held stock ever, but IBM is a poor indicator of the high-technology sentiments of institutional investors. Although institutions are always trading IBM, its institutional ownership level remains relatively stable. Actually, institutions hold much larger percentages of shares of companies like Digital Equipment Corp. (86%), Texas Instruments, Inc. (71%) or Tandem Computers, Inc. (69%) but in considerably fewer portfolios. As a result, prices of these stocks are volatile.

Observe acquisition rates

To single out the high-technology darlings in the making, it is necessary to observe institutional ownership acquisition rates as soon as the company goes public. Second on our list is Seeq Technology, the manufacturer of electrically erasable programmable read-only memory semiconductors. Seeq Technology's institutional ownership zoomed from a mere 0.78% in February 1984 to 27% by the beginning of 1985, which translates into an average monthly acquisition rate of about 344%.

Stratus Computer, Inc., the fail-safe computing start-up, recently caught the attention of IBM. Stratus is also among the institutional rising stars whose monthly accumulation rate averaged 26% in 1984 with 22% of its outstanding shares in professional portfolios.

Tandem, the established leader in the fail-safe computing business, has so far withstood the challenge, and its institutional ownership edged from 62% in January 1984 to almost 70% one year later. However, this does not yet reflect the effect on institutional holdings of the Stratus-IBM agreement that may seriously erode that secure position when institutions realize the full impact of the tie-up between those two firms.

Compaq Computer Corp. and Kaypro Corp. are two of the recent portable computer "pure plays" that illustrate how institutions did not go for the concept, despite extensive publicity and spectacular growth of both companies. As soon as Compaq went public, 14 institutions grabbed more than 5% of its stock. Two months later in May 1984, more than 12% of the company shares were in institutional portfolios. But this was a rather short-lived romance, and in January 1985, only 9.5% of Compaq remains in institutional portfolios.

Kaypro, by comparison, was a nonstarter with institutions that acquired 0.46% of the stock by May 1984. At the outset of 1985, Kaypro held a paltry 0.56% of the company, which is far from qualifying it to become a Wall Street darling.

Szuprowicz is president of 21st Century Research of North Bergen, N.J. and publisher of Supergrowth Technology USA.

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For more information, contact Ed Marecki, National Sales Director, *Computerworld Focus,* 375 Cochituate Rd., Framingham, MA 01701. Or call (617) 879-0700.

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Kodak to buy electronic imaging firm

ROCHESTER, N.Y. — Eastman Kodak Co. recently announced plans for its second acquisition in recent weeks with an agreement to pay $56.3 million for all outstanding shares of Eikonix Corp., an electronic imaging company located in Bedford, Mass.

Earlier, Kodak had announced an agreement to acquire Verbatim Corp., the Sunnyvale, Calif.-based manufacturer of floppy disks and other storage products.

Meanwhile, Kodak's rival in the instant photographics market, Polaroid Corp. of Cambridge, Mass., announced recently it had signed an agreement to buy the U.S. operations of Verbatim's Data Encore diskette duplication service.

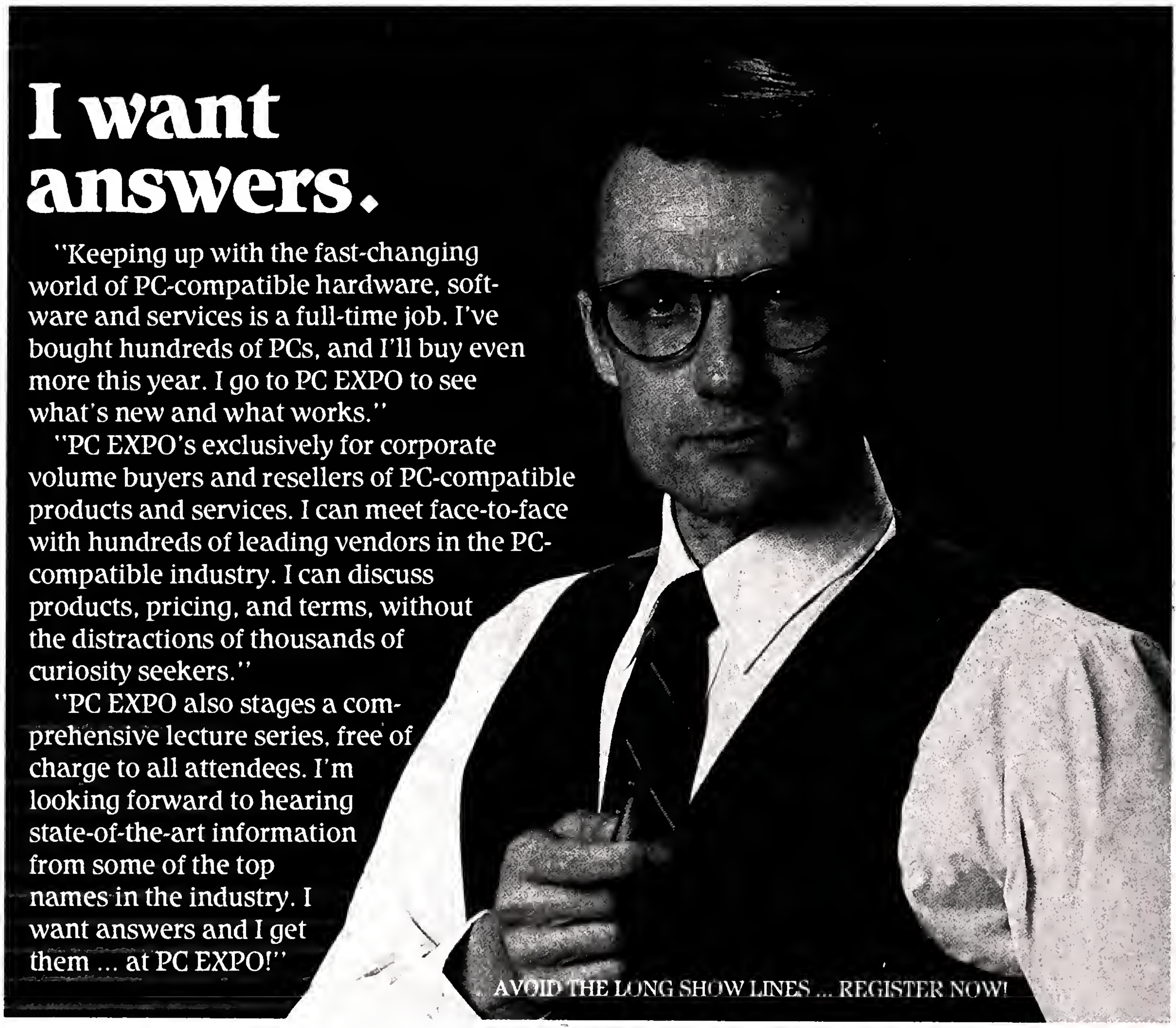
The Data Encore operation, not included in the Kodak acquisition of Verbatim, provides software duplication and copy protection devices.

Polaroid, which, like Kodak, is seeking to expand into the computer products field, also announced in March that it had increased its ownership in Advanced Color Technology, Inc. (ACT) from 38% to 82%. Polaroid acquired its initial investment in ACT, a designer and manufacturer of color ink-jet printers, in October 1983.

Kodak said it had agreed to purchase in excess of 50% of Eikonix's stock from several officers and directors and certain shareholders for $16.12 a share. It will also seek the remaining shares for the same price.

Eikonix produces such merchandise as digital cameras, laser beam recorders, scanners and image processing systems and in 1984 posted revenue of more than $6.5 million. The company will be operated as a wholly owned subsidiary of Kodak following completion of the agreement, Kodak said.

J. Phillip Samper, Kodak executive vice-president and general manager of the company's Photographic and Information Management Division, said the acquisition "provides an important element in our long-term business strategy for both our Graphics Imaging Systems Division and our Atex subsidiary."



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PE elects McDonell board chairman

NORWALK, Conn. — Perkin-Elmer Corp. recently elected President and Chief Executive Officer Horace G. McDonell as chairman of the board. Executive Vice-President of Operations Gaynor N. Kelley was named president and chief operating officer, and McDonell will continue as CEO.

McDonell succeeded Robert H. Sorensen, who had served as chairman since 1980. Sorensen will remain on the board of directors until the company's annual meeting in November.

McDonell served as president and chief operating officer of PE from 1980 until 1984, when he was elected CEO.

Since joining the firm in 1952, he has served as executive vice-president of operations, senior vice-president and vice-president and general manager of the instrument group. He is also a director of Uniroyal, Inc.

Bell Atlantic to acquire computer chain

DALLAS — Compushop, Inc., a 53-store computer retailing chain in the West and Midwest, recently announced it will be acquired by Bell Atlantic, the Bell system's Philadelphia-based holding company for the mid-Atlantic states.

Bell Atlantic also recently acquired Sorbus, Inc., a nationwide computer maintenance firm, and Tricontinental Leasing Corp., an equipment leasing and financing company. In addition, Bell Atlantic holds a majority interest in A Beeper Co., which markets electronic paging equipment and cellular telephones.

Under terms of the acquisition, one share of Bell Atlantic common stock will be exchanged for 14 shares of Compushop common stock, of which there are approximately 3.5 million shares outstanding. Bell Atlantic will also hold the option to purchase all remaining unissued Compushop stock.

Bell Atlantic reported sales of $973 million, or $9.94 per share, in fiscal 1984 and recently increased its annual dividend to $6.80 per share.

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IBM exec named

SAN JOSE, Calif. — IBM recently announced the appointment of Ray S. AbuZayyad to president of the General Products Division here.

AbuZayyad, formerly assistant to the group executive of the former Information Systems and Technology Group, replaces John E. Bertram, who was named group executive of the new Information Systems Technology Group [CW, March 18].

The General Products Division is responsible for worldwide development and U.S. manufacturing of storage systems and program products.

AbuZayyad was general manager of the San Jose facility from 1982 to 1984 and was appointed a division vice-president in 1983.

DATAPOINT from page 77

pates remaining on board after a sale is negotiated.

Edelman's strategy has been to maximize the return to shareholders by selling off portions of stock for more than the market value of the company as a whole. He similarly wrested control of Management Assistance, Inc. and liquidated that company and was named vice-chairman of Mohawk Data Sciences Corp. with a similar goal.

Despite Edelman's strategy, Gistaro said, customers will benefit because the components of the company will be placed "in very strong hands."

The battle between Edelman and the Datapoint board, which was reconstructed in the settlement to give Edelman 50% voting control on the board, had a negative impact on customers and sales personnel, Gistaro said. This, in addition to an industry-wide slowdown, has reduced sales over the past few months, he said.

However, Gistaro said, the fact that a settlement was reached amicably "will have a salutory effect" on sales and customer relations.

A further part of the settlement was that Edelman will be reimbursed for expenses incurred in his takeover effort. Gistaro said reimbursement can be no more than $1.5 million.

The company still faces a shareholder lawsuit challenging retention bonuses, or "golden parachutes," established by the board when O'Kelley was in charge. Reportedly $15 million was placed in trust for 36 top officers. Gistaro said funds were placed in trust for "various reasons, not just retention bonuses."

WANG from page 77

larger amount of standard-based code that had to be written for the product than we had expected."

According to Wang, the son of the company's founder and chairman An Wang said much of the Wang Office system could not be tested until the entire system was up and running.

Capturing the market

Much of the briefing focused around how Wang intends to capture the emerging market for what it calls "integrated information processing" in the office environment.

Company executives stressed that Wang is positioning itself to be the major alternative in the office environment to IBM and is taking a systems approach to processing voice, image, data and text in the integrated office.

The difference between Wang and other vendors, the executives said, is that Wang perceives the network itself as the center of corporatewide processing, rather than a host processor.

Total solutions provider

Samuel F. Gagliano, vice-president of product planning and product strategy, said the company intends to be a total solutions provider for small businesses and provide Fortune 1,500 companies with departmental data processing and office automation systems that will tie into IBM-based corporate MIS.

Gagliano said Wang's VS series of processors will form the basic office engines for word and data processing, linking downward to word processors and microcomputers and linking upward to centralized processing systems.

In a month or so, Gagliano said, Wang will announce a desktop system that will include Wang's 2200 small business system architecture on a chip, using very large-scale integration to package what formerly required 11 circuit boards.

Also, Gagliano added, sometime in the next few months, Wang will introduce a multiuser type of microcomputer system.

"The next step is to place the VS system on a desktop," Gagliano added.

Aggressive ad campaign launched

In the meantime, the company has mounted an aggressive advertising campaign aimed at shooting holes in IBM's apparent attempts to sell department systems based on its System/36.

The campaign, belittling the System/36 and IBM in general, "is step one in getting [Wang] aggressive again," according to Robert L. Doretti, senior vice-president of U.S. operations, sales and marketing strategy.

Cunningham expressed some resentment at IBM for announcing products and statements of intent that reach far into the future. However, he stopped short of saying IBM is intentionally seeking to disrupt competitor's marketing plans.

"I don't think IBM understands the disruption in the marketplace caused by statements of direction and some long-term product announcements," he said.

Cunningham added, "It is very difficult for any player to compete against some of the more nebulous [IBM] direction statements."

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Direct, control and coordinate all aspects of operating systems software along with providing state-of-the-art, cost-effective and risk-identified solutions to meet the business needs of the user community and internal departments.

BS in Computer Science, Business, Mathematics or Engineering are required as is 7 years' DP experience, including 5 years in Systems Programming and 4 years in IBM Operating Systems or (MVS/XA). Strong communications and demonstrated project management skills essential. MBA desirable.

SENIOR SYSTEMS PROGRAMMER

Responsible for the hands-on technical challenges of our dynamic environment. Appropriate educational background combined with at least 4-6 years' relevant experience are required. (3-5 years in a large IBM mainframe environment.) Individual with project leader, SNA, and IMS/DC experience is needed.

INFORMATION CENTER LEAD ANALYST

Personal computer expert providing technical and administrative support for end user computing needs. Must be knowledgeable in diverse PC hardware and software, as well as having 3-5 years' experience in a large-scale computer environment. Will function as backup to supervisor. A proven track record of user interface experience with good interpersonal skills is a must.

SENIOR Q.A. ANALYST

Develop EDP guidelines and standards; review all phases of EDP tasks, assuring their compliance with department standards; and provide advice to project teams concerning design and programming technology.

Bachelor's degree in Computer Science, Business or Engineering, with a minimum of 4-6 years' DP experience, as well as a substantial background in: user interfacing; feasibility studies; interpreting user requirement definitions; system design, testing and detail logic specifications required. Technical abilities are needed in COBOL, TSO/SPF, ISPF/Panvalet, OS/MVS, JCL, large-scale IBM equipment, IMS, multiple file structures. Operations and/or quality assurance experience preferred.

DATA BASE ADMINISTRATOR

Advise data base analysts in the design and use of application data bases. Develop various types of data base definitions; maintain IMS gen source definitions for transactions, data bases and security; develop IMS utilities for SMU/unload/reload, image copy/restore, etc.; perform data base recovery as required.

In addition to a Bachelor's degree, you must have at least 3 years' DP experience, 1 year of IMS programming and/or data base design. Knowledge of the IBM Data Dictionary and data base utilities desired.

SENIOR COMPUTER PRODUCTION CONTROL TECHNICIAN

Maintain proper utilization of large-scale computer systems, with emphasis on processing interruptions and system failures, computer work-load scheduling and Job Control Language setup.

BS in Computer Science or Business Management with a minimum of 5 years' computer operations/programming experience and a thorough knowledge of existing computer hardware and its functions, UCC—7 Automated Production Control System, Job Control Language and UCC—11 Job Management System.

SENIOR ANALYST PROGRAMMER

Develop applications and business systems to enhance our DP environment. You must have the educational background and experience to support this position. 3-5 years in a large IBM mainframe environment. Knowledge of Mark IV, IMS DB/DC and ADF would be a plus.

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Entry-level openings exist throughout our DP group.

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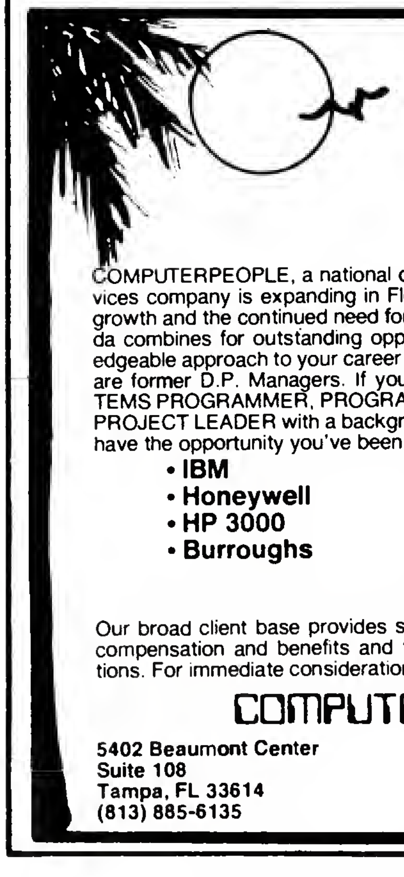

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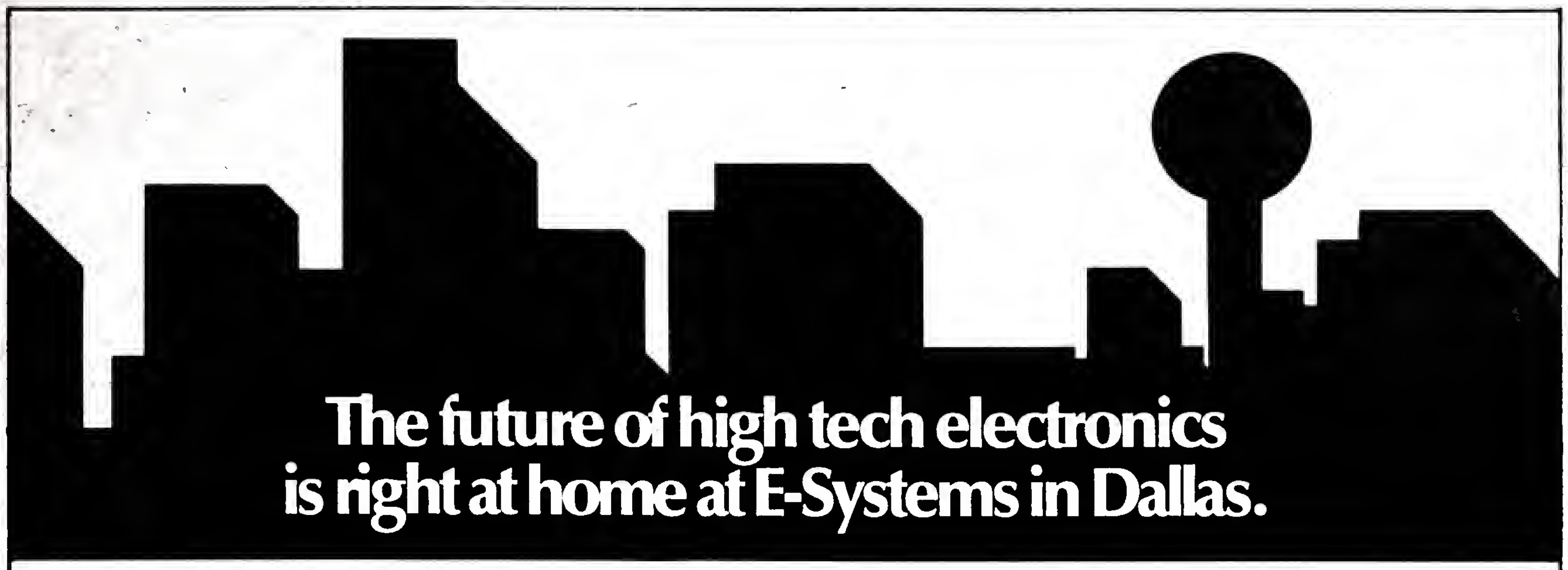

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Sr. Systems Analyst

Position immediately available for individual to gain experience in a State-Of-The-Art, primarily IBM, environment developing and implementing on-line business applications at THE PENNSYLVANIA STATE UNIVERSITY in the office of the Vice President for Business.

Enjoy a stimulating University environment, educational opportunities, a pleasant community, excellent schools, liberal fringe benefits and an attractive salary.

Requirements include a Bachelor's Degree or the equivalent and a minimum of 4 to 7 years of effective experience in programming, system design and analysis. Position requires significant ongoing user interaction.

Send letter of application, resume and salary requirements to:

Employment Division
117 Willard Bldg., Box CW-17
University Park, PA 16802
Application D/L, April 10

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ASSEMBLER PROGRAMMING PROFESSIONALS

In 1973, **Compuware** was just an idea, a dozen employees and $300,000 in revenues. Today, we have grown to over 600 permanent salaried employees and have revenues in excess of $45 million. **Compuware** is dedicated to researching, developing and marketing innovative data processing products and services.

Compuware develops software products for the IBM mainframe market. Our internationally known award winning products, **Abend-AID** and **File-AID,** have over 2,500 users worldwide.

Our environment will provide you with a unique opportunity to **DEVELOP, MAINTAIN, SUPPORT AND DISTRIBUTE** your code to our users. We are not the normal data processing shop! Our products run on the most current releases of IBM's operating systems. Our products must also run on VSI and older DOS releases. Can you step up to the challenge of writing code that will run on this variety of environments? Do you have the foresight to program for the unforeseen changes to operating systems and environments?

Some of our programmers are Systems Programmers that decided that they wanted to create the software that they always wanted. Others are good Assembler Programmers that wanted to learn more about systems. These programmers found a home. Our Technical Development and Support Group personnel enjoy what they are doing.

Due to expansion within our division, we have immediate opportunities available in the following areas:

PRODUCT DEVELOPERS

The Product Developers are the backbone of the Technical Development and Support Department. Their expertise is relied on for new product development and product maintenance. We are currently looking for Product Developers to work on our **CICS, IMS-DC, File-AID** and **DOS** products. The qualifications for these positions are:

- **CICS** — These individuals will assist the **CICS** team to develop new enhancements to our current products and maintain these systems. A thorough understanding of **CICS** is necessary.
- **IMS-DC/VTAM** — This person will provide our group with the expertise in **VTAM** or **IMS-DC** to bring a new product to market.
- **File-AID** — This individual will contribute to the **File-AID** team by assisting them in developing and maintaining the **File-AID** product line. A good understanding of **OS** and **MVS** systems, data management and file systems is necessary along with a thorough comprehension of **ISPF/PDF.**
- **DOS** — We are currently looking for individuals to assist us in converting our products to **DOS SP2.I** and to assist in the development of a batch interactive testing facility using **BTAM.**

PRODUCT SPECIALISTS

The Product Specialist is the sales/technical interface of the Products Division. Their primary responsibility is to provide the sales staff with the tools that are necessary to sell our products and to provide our customers with the training and support they need to use our products. In-depth knowledge of programming environments and our products is essential. Specific areas of concentration are:

- **DOS** — Our involvement in the **DOS** marketplace is always increasing. Due to this expansion, we require an individual that understands the **DOS** environment to assist our sales staff and development team to market our products and further improve our presence in the marketplace.
- **File-AID** — This product has expanded so rapidly that we need to add another Product Specialist to our staff. This individual will possess excellent presentation skills and a thorough knowledge of **ISPF/PDF.**

PRODUCT SUPPORT REPRESENTATIVES

The Product Support Representative's purpose is to supply the highest level of professional and technical assistance to **Compuware's** customers and sales staff. Specific areas of expertise that we are looking for include:

- **CICS** — This individual will assist our team to support our customers and sales staff in the use of our **CICS** product line.
- **GENERAL SYSTEMS** — This individual will provide support to our customers in a variety of areas. We are looking for an individual with a good systems background.
- **DOS** — This person will interface with our customers and sales staff to support our **DOS** line.

PRODUCT SALES REPRESENTATIVES

The individuals we are seeking must possess the following qualifications:

- Proven, successful track record in data processing or data processing related sales, management or a successful technical background in IBM mainframe programming.
- Excellent communication skills.
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If you're seeking greater challenges than your current position allows, you'll enjoy **Compuware's** diverse, excitingly innovative and highly advanced projects. Your efforts will be recognized and rewarded with a salary commensurate with experience, comprehensive benefit package, including paid relocation, incentive bonuses and a unique career advancement program for data processing technicians and, you'll enhance your skills with our proven in-house training program. You may send your resume in confidence to Anne Jones or call weekdays from 9:00 a.m. to 5:00 p.m.

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Position open for an ACP Systems Programmer/Programmer Analyst, electronic data processing. Duties include: Converting symbolic statements of administrative data for business problems to detailed logical flow charts for coding into computer language. Analyzes all or part of work flow chart or diagram representing business problems by applying knowledge of computer capabilities, subject matter, algebra, and symbolic logic to develop sequence of program steps. Confers with supervisor and representatives of departments concerned with program to resolve questions of program intents, output requirements, input data acquisition, extent of automatic programming and coding use in modification, and inclusion of internal checks and controls. Writes detailed, logical flow charts in a symbolic form to represent work order of input, output and arithmetic and logical operations involved. Converts detailed, logical flow charts to language processable by computer.

B.S. degree in engineering or computer science and three years experience in airline control programming (ACP) environment required. Ability to work well in a group situation is a must. Applicant must also be familiar with CMS programming systems. Minimum salary to be $25,000 per year for a 40 hour work week, however, additional salary up to $44,000 per year will be paid if applicant possesses additional experience.

Interested applicants should contact The Oklahoma Employment Security Commission, 3105 East Skelly Drive, Tulsa, Oklahoma 74105. Phone: (918) 749-6861. Refer to job order #090519.

ASSISTANT VICE PRESIDENT

Communications & Technical Support

Excellent opportunity in the MIS department of this leading Midwest lending institution. Will be responsible for: directing the operations and development of local area and remote data/voice networks supporting over 350 business computers; providing systems programming support for IBM 4341 and VAX 11/780; and directing hardware dvelopment and office automation.

We are seeking an individual with 5-7 years directly related experience in networking, systems programming, and on-line applications development; 3-4 years in an IBM mainframe environment; demonstrated management/supervisory skills; baccalaureate degree in computer science or related field.

Competitive salary plus comprehensive benefits and relocation plans are offered. If you are an innovative leader with sound technical expertise in the areas listed above, please submit your resume with salary expectations in confidence to:

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DATA PROCESSING OPPORTUNITIES

The Judiciary of the state of New Jersey is actively seeking qualified candidates for 3 professional positions which report to the Assistant Director of Information Services for the NJ Court Systems.

INFORMATION SYSTEMS DEVELOPMENT MANAGER

$39,000-$53,000. BS degree in Data Processing and 6 years comprehensive analysis, design, programming and implementation experience including 3 years of which shall have been in systems analysis and 2 years of which shall have been in a supervisory or management capacity. Experience or courses in systems development methodologies, data base management, programming and teleprocessing desirable.

CHIEF OF TECHNICAL SUPPORT

$37,000-$50,000. BS degree in Data Processing and 5 years comprehensive analysis, design and implementation experience incuding 3 years of which shall have been in systems programming, computer equipment evaluation and systems configuration and 2 years of which shall have been in management of operating systems programming and related staff. Familiarity with IBM and/or compatible mainframes and smaller systems essential, as is knowledge of CICS, MVS, DL1, VSAM, VTAM, Assembler, TSO, COBOL, and data base management software.

PROJECT CONTROL MANAGER

$34,000-$46,000. BS in Data Processing and 5 years experience in program management with responsibility for planning, organizing, coordinating staffing and budgeting in a Data Processing environment or assisting an executive with program development and implementation which involved Data Processing. Experience or courses in systems development and methodologies is desirable.

Note: Master's Degree in Computer Science may be substituted for 1 year of nonsupervisory experience for the above positions. Applicants who do not possess the required education may substitute experience as indicated on a year for year basis. All positions are located in Trenton, NJ and are non-civil service (unclassified).

Resumes will be accepted until April 22, 1985. Natalie P. Smith (DP), Judiciary Personnel Office, Richard J. Hughes Justice Complex, CN-037, Trenton, NJ 08625.

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Worthington, Ohio 43085 (614) 846-0926
DALLAS: DataPro Personnel Consultants
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Dallas, Texas 75230 (214) 661-8600
DENVER: Abacus Consultants, Inc
1777 South Harrison, Suite 404
Denver, Colorado 80210 (303) 759-5064
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Seeking instructor to teach undergraduate software engineering technology courses. Applicants will be expected to teach one or more of the following courses: computer graphics, data structures, structures of programming languages, pattern recognition, and artificial. intelligence. Minimum requirements, M.S. in Computer Science or related area. Preference given to those with related industrial experience. Rank and starting salary contingent upon exp. and qual's. Nine-month, fixed term appointment. Mail resume to:

Ms. Shelby Wilsdon, Personnel Director, Oregon Institute of Technology, Klamath Falls, OR 97601 (503) 882-6321, ext 442. Applications/resume must be postmarked no later than May 15, 1985.

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ENGINEERING SCIENTIST -- Research in the areas of computer networking, artificial intelligence, and software engineering, with special foci in the areas of: (1) design and analysis of high performance, error-free communications protocols, using software; (2) expert systems for protocol implementation; (3) network operating systems design; and (4) distributed computing in high-performance local-area networks. 40 hours per week. 8:30 am - 5:15 pm. $40,000 per year. Must have Ph.D in Computer Science and Ph.D studies must have included course work in computer networking, artificial intelligence, software engineering and operating systems; and research experience in communications protocols and expert systems programming in LISP, PASCAL, and FORTRAN programming languages. No training or experience required. Send resume to: Illinois Job Service, 910 S. Michigan Ave., Room 333, Chicago, IL 60605, Attn: Mary Millea, Reference Number 4238-M. An employer paid ad.

SENIOR SYSTEMS PROGRAMMER

(Technical Support)

Provide total technical support for IBM 4341-M2 with VSE, CICS, VSAM, COBOL, 3270 network. Progressive environment; great professional challenge. Minimum requirements include: BS in computer science or a related field and 5 years of IBM programming and systems experience. Candidate will act as technical consultant for computer services department; experience must be in a data processing organization using an IBM 4300 or larger computer system. Hours of work are 8:30 am to 5:00 pm Monday thru Friday. Starting salary is $29,617 per year. Send resume to Job #5685, 7310 Woodward Avenue, Room 415, Detroit, MI 48202. An employer paid ad.

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SENIOR CONSULTANT/PROJECT LEADER (2) DOCUMENTATION SPECIALIST

Exciting opportunities for qualified individuals to join the University Information Systems team at Case Western Reserve University. CWRU is involved in a major development effort to provide state-of-the-art management systems throughout the University based on a large DEC installation. The Senior Consultants will each head major projects, the Documentation Specialist will take responsibility for standards and documentation.

To qualify you should have a track record of success in:

- **Design and implementation of major application systems**
- **Use of on-line, data-base systems technology**
- **Knowledge of 4th generation languages and data dictionary**
- **Programming and supervision of programming activities**
- **Communication with users and peers based on excellent literacy and strong interpersonal skills**

Experience using **DEC10/20** or large **VAX** systems and distributed minis/micros in a business environment is highly desirable.

All candidates, but especially those for the position of Documentation Specialist, should have experience using a formal systems development methodology.

Successful candidates for these challenging career positions will receive competitive compensation, relocation assistance, and excellent benefits (including, after a qualifying period, tuition assistance for incumbent and family in CWRU's nationally recognized post graduate/undergraduate programs.)

Contact **Peter J. Haigh of KMG Main Hurdman,** One Oxford Centre, Pittsburgh, PA 15219, phone 412/281-8000, who is directing this recruitment. All inquiries will be held in strictest confidence.

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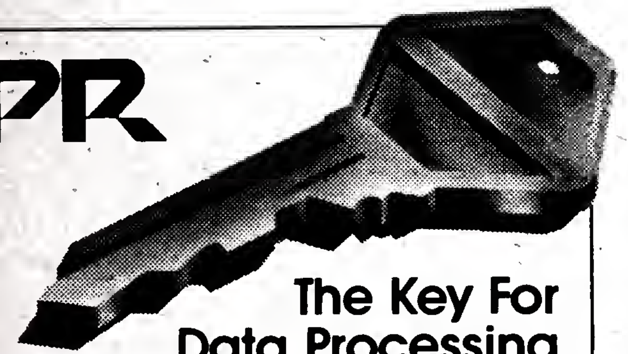

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Advanced Programming Resources, Inc., a dynamic growth-oriented contract services organization, is expanding into the South/Southeast region, and we have an immediate need for seasoned professionals.

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- Local Area Networking
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APR provides an excellent salary ($35-45K range), along with fully paid company benefits. If you feel you want to join the leader, please call and/or send your resume in confidence, to: **ADVANCED PROGRAMMING RESOURCES, INC., 6800 North High Street, Worthington, Ohio 43085, (614) 888-3968.** An equal opportunity employer, m/f.

APR
ADVANCED PROGRAMMING RESOURCES, INC.

Alyeska pipeline
SERVICE COMPANY

Alyeska Pipeline Service Company, the operator of the Trans-Alaska Pipeline, has two openings in its SCADA group located in Valdez, Alaska. Valdez is a port city of approximately 3,500 population and serves as the marine terminal for the pipeline. The city has excellent schools and outstanding recreational activities for the sports and outdoor-oriented family. Alyeska is currently installing three Data General MV/10000 computers operating under AOS/VS.

STAFF SOFTWARE SPECIALIST

This position is responsible for providing SCADA with an effective and stable operating computer environment through system level software generation, installation, and maintenance. Assures the reliable operation of the SCADA applications systems by monitoring the system performance and recommending and making changes to improve the system. This position will also have application systems maintenance responsibilities. Requires five years experience in systems programming including system level software on Data General's AOS/VS operating system. SCADA applications experience is preferred. A degree in computer science or engineering is preferred but additional experience may be substituted for education.

SENIOR SUPERVISORY CONTROL ANALYST

This position will be responsible for the maintenance, design, development, and implementation of supervisory control, metering and other oil movements and measurement computer applications systems. This position requires five years SCADA computer programming and design experience using both Fortran and Assembly languages. Candidates with experience on Data General AOS/VS Operating Systems will be given preference. A degree in Computer Science or Engineering is preferred but additional experience may be substituted for education.

Alyeska offers competitive Alaska Salaries and fringe benefits including a Valdez location differential and a company paid fly-out program for its employees and dependents.

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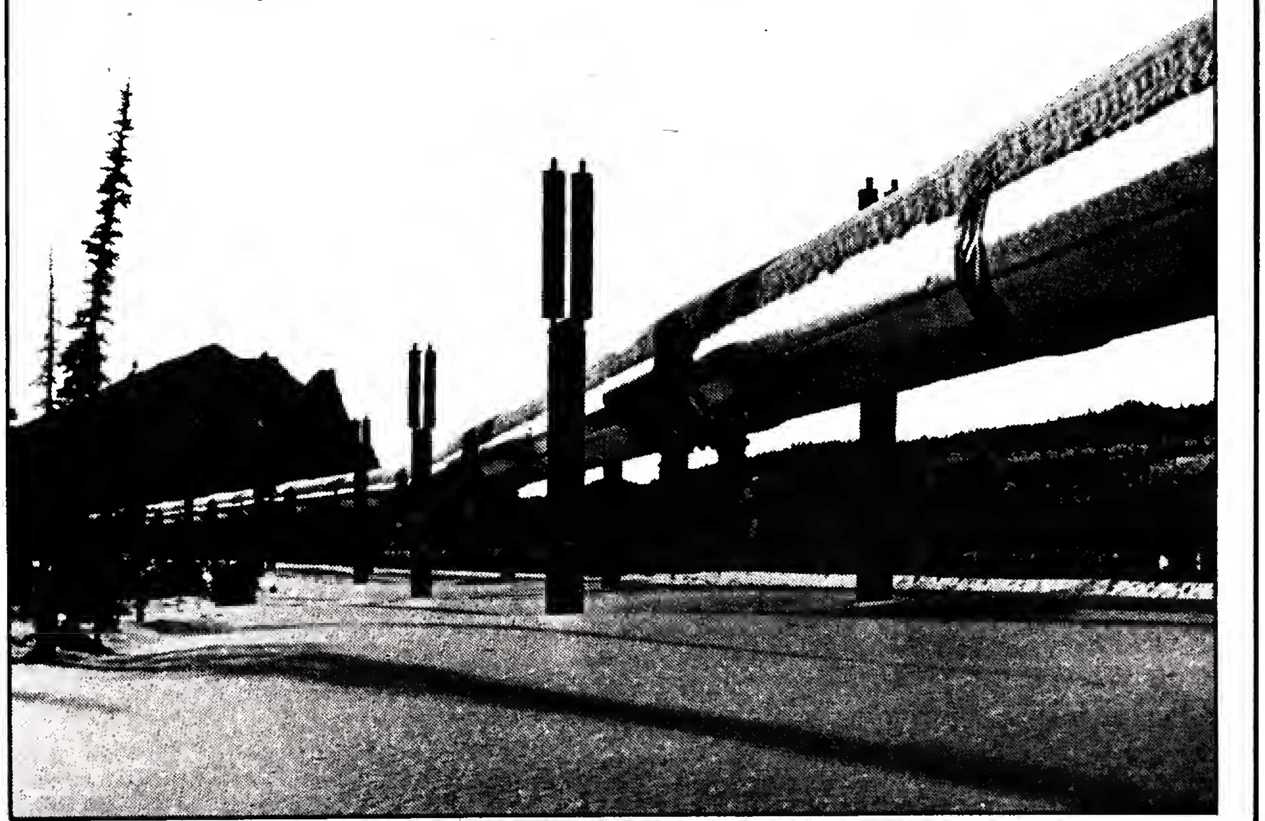

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Systems Programmers

Pfizer's Connecticut Data Center is seeking two individuals who are looking for a career opportunity which offers both a challenge for today and the future.

Software Programmer -- DECsystem-10

Responsibilities will include installing and maintaining a TOPS-10 operating system in a SMP environment which includes DN20 (PDP-11) communications software, developing system software for support of DECsystem-10 computers, providing both technical support and education to computer users and operators. Additional duties include assisting users in the development of application software and evaluation and installation of software packages when appropriate.

In addition to maintaining our current DECsystem-10 environment, we have already started a migration to the VAXcluster environment which offers future growth opportunities for individual filling this position.

Qualifications for this position include a BS/MS in Computer Science or Information Science, 3-5 years systems programming experience on DECsystem-10 computers, experience installing and maintaining DECsystem-10 operating systems, and a thorough knowledge of MACRO-10. Working knowledge of MACRO-11, computer networks, and application development desirable. Experience with VAX hardware and software a plus.

Software Programmer -- VAX systems

Responsibilities will include installing and maintaining VMS operating systems, developing system software for support of VAX computers, and providing both technical support and education to users and operators. Also included is the evaluation and installation of software packages as well as assisting users in the development of application software when appropriate.

Qualifications for this position include a BS/MS in Computer Science or Information Science, 3-5 years systems programming experience with VAX computers, and experience installing and maintaining VAX VMS operating systems. Working knowledge of computer networks, application development, and one or more high-level language highly desirable. Experience with DECsystem-10 hardware and software a plus.

Both of these positions offer a stimulating professional environment in an attractive Connecticut shore area, complemented by a competitive salary/benefits package (relocation assistance available). Qualified applicants may submit detailed resume in confidence to: Mr. Charles P. Norris, Personnel Associate, Pfizer Central Research, Eastern Point Road, Groton, CT 06340.

Pfizer An equal opportunity employer

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Our **Printer Division** has been operational as an independent organization in our U.S. subsidiary since mid 1984. We presently market in the U.S., four dot matrix printer models (b/w and color at 100/400 CPS in letter and data quality) at very competitive prices.

To respond to the continuous growth of our **Printer Division**, we have openings for:

National Sales Manager(based in Linden, NJ)
Product Manager (based in Linden, NJ)
Sales Support Manager
Regional Sales Manager

These individuals must be willing to establish their own autonomous operation and to deeply penetrate the U.S. printer market.

We seek highly motivated professionals to work hard to achieve results and growth, and who would like to share in the profits of their achievements.

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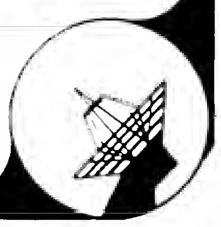

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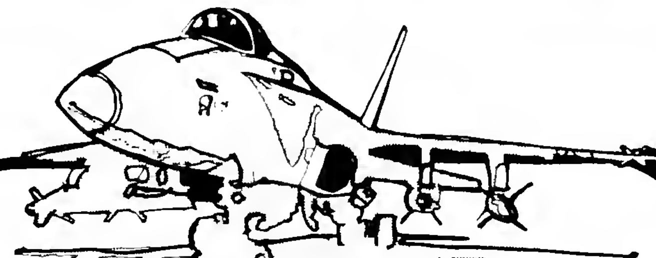

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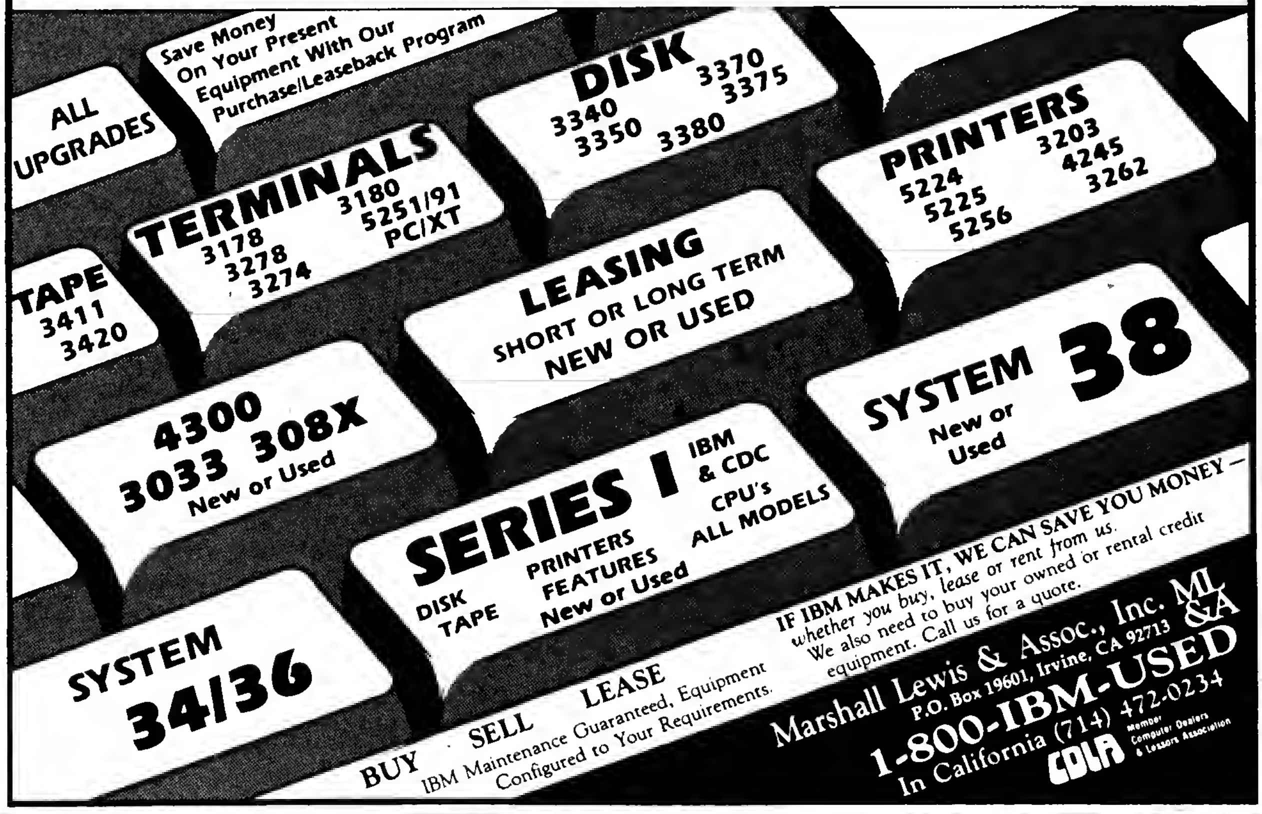
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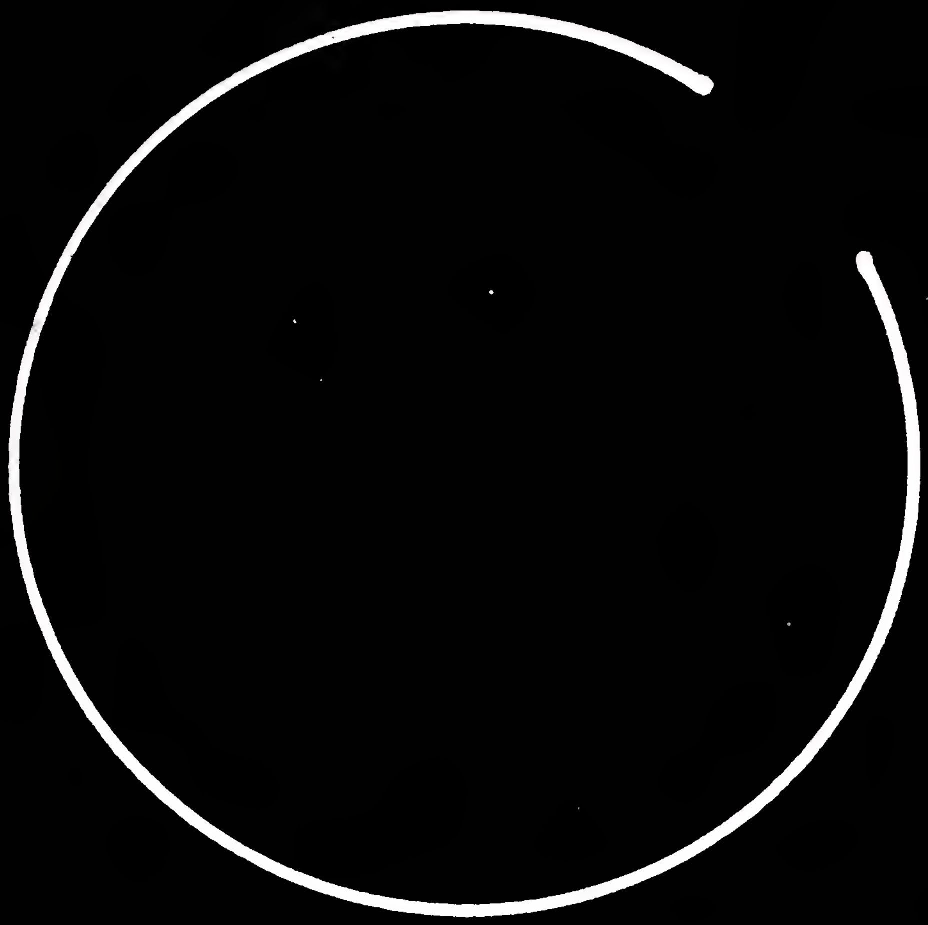

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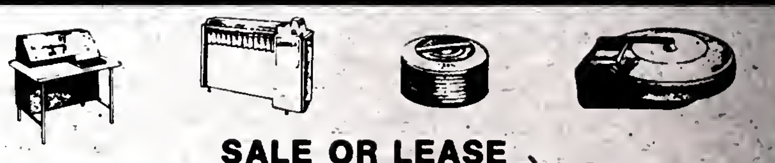

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SYSTEMS	MIPS (Millions of Instructions Per Second)	MEGABYTES
4321	0,25	1
4331-1	0.25	0.5 to 1
4331-11	0.38	1 to 2
4331-2	0.50	1 to 4
4341-9	0.52	1 to 4
4361-3	0.70	2 to 4
4341-10	0.75	2 to 4
4341-1	0.88	2 to 4
4341-11	1.1	2 to 8
4361-4	1.15	2 to 12
3031	1.2	2 to 8
4361-5	1.45	2 to 12
4341-2	1.5	2 to 16
4341-12	1.65	2 to 16
3031AP	2.0	2 to 8
4381-1	2.1	4 to 16
3032	2.5	2 to 8
4381-2	2.7	4 to 32
3033S	2.9	4 to 16
•3083CX	3.3	8 to 32
•4381-3	4.0	8 to 32
3083E	4.2	8 to 32
3033N	4.3	4 to 16
3083X	4.4	8 to 32
3033UP	5.0	4 to 24
3083B	6.3	8 to 32
3083BX	6.6	8 to 32
3083J	8.4	8 to 32
3033MP	8.5	8 to 32
3033AP	8.5	4 to 24
3083JX	8.8	8 to 32
3081D	10.0	16 to 32
3081G	11.0	16 to 48
3081GX	11.9	16 to 64
3081K	14.0	16 to 48
3081KX	15.5	16 to 64
3084G	26.6	32 to 96
3084QX	28.7	32 to 128
•3090-200	29.4	64 to 192
†3090-400	52.9	128 to 384

• First Installation 1985 †First installation 1987

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SYSTEMS	MIPS	MEGABYTES
470V/7A	4.5	8 to 32
470V/7	5.5	8 to 32
470V/8	6.5	8 to 32
5840	8.4	16 to 64
5850	11.6	16 to 64
5860	14.0	16 to 64
5867	22.0	24 to 64
5868	22.0	32 to 128
5870	26.6	16 to 64
5880	26.6	32 to 128

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AS/8043	.5.2	8 to 32
AS/8053	6.5	8 to 32
AS/8063	8.4	16 to 32
AS/9040	7.2	8 to 48
AS/9050	9	8 to 48
AS/9060	11.2	16 to 64
AS/9070	16.2	16 to 64
AS/9080	20	16 to 64
†AS/XL-60	28	32 to 256
†AS/XL-80	50	64 to 256

†First installation 1986

The above information is intended as a guideline for computer users on relative computer system instruction cycle times. All data have been derived from published documentation and represent reasonable estimates of average MIPS ratings. However, Randolph is not responsible for the accuracy of the MIPS data. Cycle times will vary based upon hardware/software configurations, and system manufacturers continually. modify computer models as design improvements in hardware and software arise.

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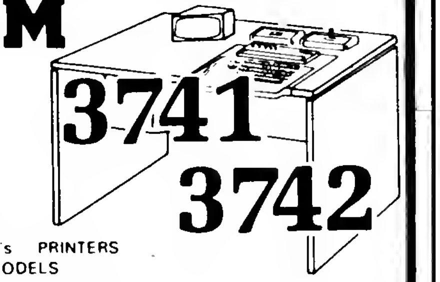

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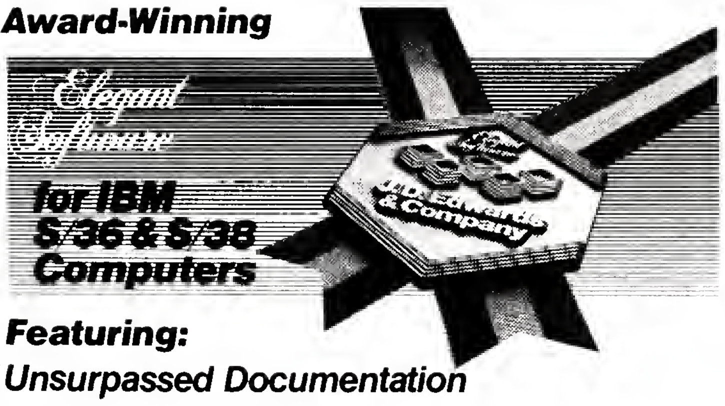

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Italy: Oaniele Comboni, Gruppo Editoriale Jackson, s.r.1, Via Rosellini 12, 20124 Milano.

Japan: Mr. Shuji Mizuguchi, Computerworld Japan, 7-4 Shintomi 1-Chome, Chuo-ku, Tokyo 104. Phone: (03) 551-3882, Telex: 252-4217 (Computerworld Japan only).

H. Kajiyama, Tokyo Representative Group, Sanshin Kogyo Bldg. 3F, 2-10 Kanda Jimbo-cho, Chiyoda-ku, Tokyo 101, Phone: (03) 230-4117/B, Telex: J26860 (reps for all CWCI publications except Computerworld Japan).

Mexico: Richard Small, Computerworld de Mexico, Oaxaca 21-2, Colonia Roma, Mexico City 7 D.F. Phone: (905) 514-4218, (905) 514-6309. Telex: 1771300 ACHAME, 1777809 ACHAME.

Norway: Mr. Morton Hansen, Gen. Mgr., CW Norge A/S, Hovinveien 43, P.O. 8ox 2B62. Toeyen, Oslo 6. Phone: 2/647725. Telex: (856) 7647725.

Saudi Arabia: Mr. Omar Ousuki, General Manager, Saudi Computerworld, P.O. Box 5455, Jeddah. Phone: 6519690. Telex: (92B) 401205.

Southeast Asia: Mr. Oavid Naidu, General Manager, Asia Computerworld, Pte. Ltd., 11-08/11-10 Goldhill Plaza, Newton Road, Singapore. Phone: 250-4444. Telex: (786) RS 37003

Melvyn 8ennett, Regional Sales Mgr., Asia Computerworld Pte. Ltd., 2023 Swire House, 9 Connaught Rd. Central, Hong Kong. Phone: 210395. Telex: (780) 72827 HX COMWR.

Spain: Neil Kelley, Computerworld/Espana, Barquillo 21, Madrid 4. Phone: 231-23-85; 231-23-86; 231-23-88. Telex: 47B94(CW E).

Sweden: 8engt Mamfeldt, Nova Media AB Sodra Hamnvagen 22. S-115-41 Stockholm. Phone: 46-8-67-91-80. Telex: 14904 NOVACW.

The Netherlands: Johannes A. Witvoet, Mgr. Oir., Computerworld Benelux, Van Eeghenstraat 84, 1071 GK Amsterdam. Phone: 020-646426. Telex: (844) 1B242.

Venezuela: Kalman Von Vajna Nagy, CW Communicaciones CRL Torre Maracaibo, piso 13, Oficina H, AV. Libertador, Caracas. Phone: 72-76-30.

West Germany: Eckhard Utpadel, CW Publikationens, Friedrichstrasse 31, 8000 Munich 40. Phone: (089) 38172-0. Telex: 5215350.

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Computerworld Headquarters: 375 Cochituate Road, P.O. Box 880, Framingham, MA 01701
Phone: (617) 879-0700, Telex: 95-1153.

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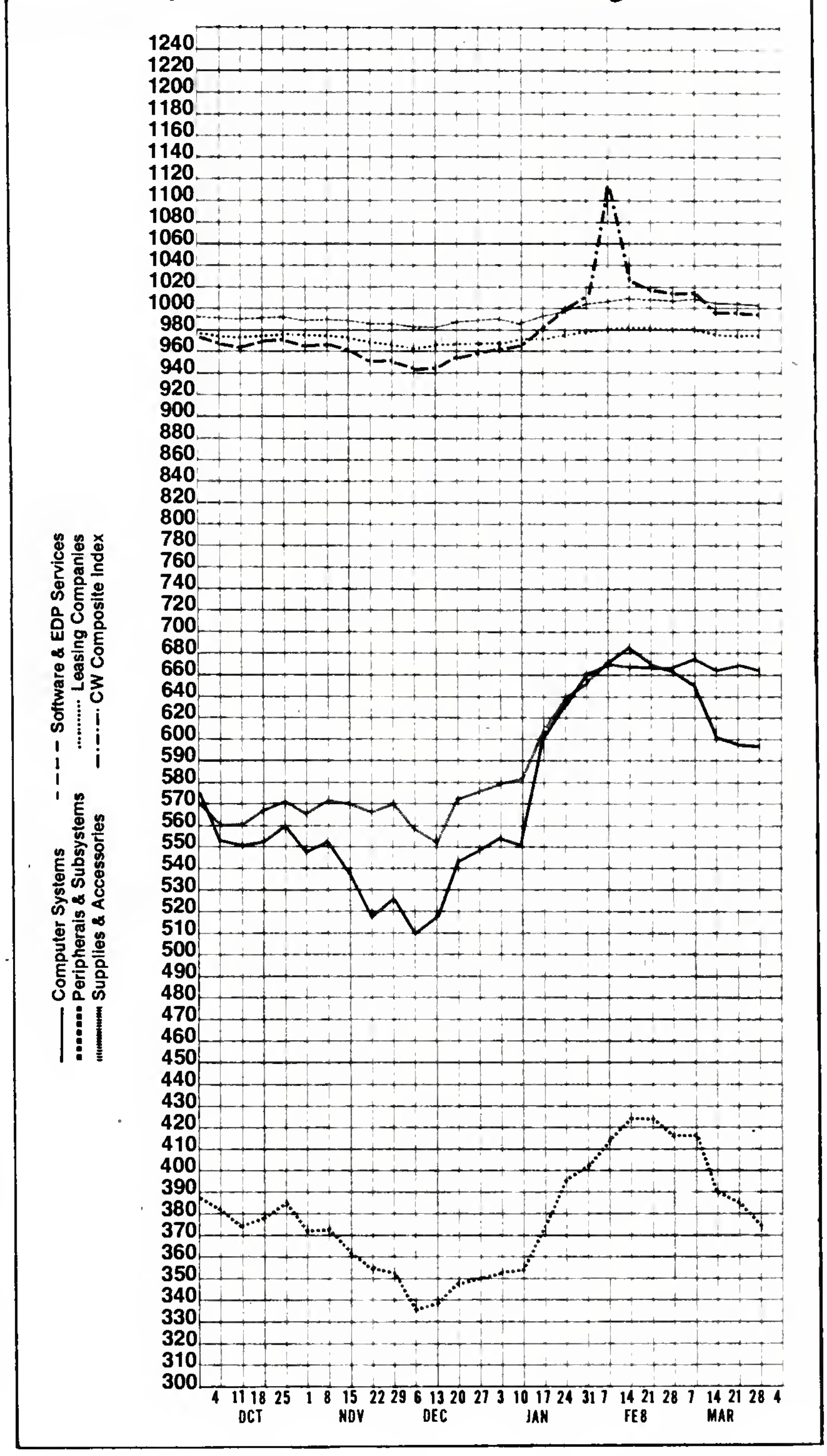

TRADE QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, MARCH 27, 1985

All statistics compiled, computed and formatted
by
TRADE QUOTES, INC
Cambridge, Mass 02139

EXCH		PRICE			
		1984-85 RANGE (1)	CLOSE MAR 27 1985	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
O	ALPHA MICROSYSTEMS	6- 24	6 1/2	+ 1/4	+4.0
O	ALTOS COMPUTER SYST	7- 21	11 3/4	+ 1/8	+1.0
A	AMDAHL CORP	10- 30	14	- 3/4	-5.0
O	APPLE COMPUTER INC	18- 62	21 7/8	- 3/8	-1.6
N	AT&T	15- 22	21 5/8	0	0.0
N	BURROUGHS CORP	44- 64	59	+1	+1.7
N	COMPAQ COMPUTER CP	4- 15	7 7/8	- 3/8	-4.5
O	COMPUTER AUTOMATION	2- 17	8	+ 3/4	+10.3
A	COMPUTER CONSOLES	8- 26	7 1/2	-1 1/4	-14.2
N	CONTROL DATA CORP	25- 62	29 7/8	-3 1/2	-10.4
O	CONVERGENT TECHNOL	5- 41	9 1/8	+ 1/8	+1.3
N	CRAY RESEARCH INC	38- 75	66 1/8	-3 1/2	-5.0
O	DAISY SYSTEMS CORP	14- 36	30 1/2	- 3/4	-2.3
N	DATA GENERAL CORP	27- 74	44 5/8	-3	-6.2
N	DATAPOINT CORP	14- 31	18 1/4	-1 3/8	-7.0
N	DIGITAL EQUIPMENT	64-125	103 3/8	+1 1/8	+1.1
A	EECO INC	12- 16	14 5/8	- 1/8	-0.8
N	ELECTRONIC ASSOC.	2- 15	4 3/8	- 1/4	-5.4
N	FLOATING POINT SYST	12- 44	26 1/4	+ 1/2	+1.9
N	FOXBORO	25- 47	26 1/4	+ 1/4	+0.8
O	GENERAL AUTOMATION	5- 16	6	- 1/8	-2.0
N	GOULD INC	20- 44	22 3/4	- 1/2	-2.1
N	HARRIS CORP	23- 49	28	- 1/2	-1.7
N	HEWLETT-PACKARD CO	31- 48	34 1/4	+ 3/4	+2.2
N	HONEYWELL INC	46- 69	58 1/4	-1	-1.6
N	IBM	103-137	125 3/8	-3	-2.3
O	IPL SYSTEMS INC	1- 14	2 7/8	+ 1/8	+4.5
N	ITT CORP	21- 47	34 1/2	+1	+2.9
N	M/A-COM INC	13- 35	19	+1	+5.5
N	MANAGEMENT ASSIST	3- 29	3 3/8	+ 1/8	+3.8
N	MATSUSHITA ELEC(ADR)	56- 88	63	- 1/8	-0.1
N	MODULAR COMPUTER SYS	6- 16	6 7/8	- 3/8	-5.1
N	MOHAWK DATA SCI	8- 17	7 7/8	-1	-11.2
N	MOTOROLA INC	28- 49	33 1/2	+ 1/2	+1.5
N	NAT'L SEMICONDUCTOR	11- 20	11 1/8	+ 3/8	+3.4
N	NBI INC	13- 36	14 1/4	+1	+7.5
N	NCR	21- 34	28 3/8	+ 7/8	+3.1
N	PERKIN-ELMER	18- 37	24 3/4	- 1/8	-0.5
N	PRIME COMPUTER INC	11- 26	15 3/8	- 1/8	-0.8
N	SPERRY CORP	35- 54	50 3/4	-1 1/4	-2.4
O	STRATUS COMPUTER INC	9- 17	15 5/8	+ 7/8	+5.9
O	TANDEM COMPUTERS INC	15- 40	22 3/8	+1 1/2	+7.1
N	TANDY CORP	24- 62	32 3/4	+ 3/8	+1.1
O	TELEVIDEO SYSTEMS	3- 41	2 7/8	0	0.0
O	TELXON CORP	8- 20	19 1/4	+1 1/4	+6.9
N	TEXAS INSTRUMENTS	101-169	112 5/8	+1 3/8	+1.2
A	ULTIMATE CORP	10- 24	11 3/8	+ 1/8	+1.1
O	VECTOR GRAPHICS INC	0- 9	5/8	0	0.0
A	WANG LABS "B"	19- 42	19	+ 1/4	+1.3
A	WANG LABS "C"	19- 42	19 3/8	+ 1/2	+2.6
N	XEROX CORP	35- 52	43 1/8	0	0.0
	LEASING COMPANIES				
O	BOOTHE FINANCIAL CP	10- 22	20 1/2	+ 1/8	+0.6
A	CMI CORP	4- 10	8 3/4	0	0.0
N	COMDISCO INC	9- 42	15 1/2	0	0.0
O	CONTINENTAL INFO SYS	5- 16	7 5/8	- 3/4	-8.9
N	DPF INC	10- 17	18 1/8	0	0.0
O	FINALCO GROUP INC	4- 12	4	+ 3/8	+10.3
O	PHOENIX AMERICAN INC	3- 17	2 7/8	0	0.0
O	SELECTERM INC	8- 21	9 1/4	+ 1/4	+2.7
N	U.S. LEASING	29- 44	38 1/4	- 3/4	-1.8
	COMPONENTS				
N	ADVANCED MICRO DEV	25- 41	32 5/8	+ 5/8	+1.9
O	ADV'D SEMICONDUCTOR	15- 38	15 3/4	- 1/2	-3.0
N	ANALOG DEVICES INC	20- 32	25 7/8	-1	-3.7
O	ANALOGIC CORP	10- 31	13 1/8	+ 1/8	+0.9
N	APPLIED MAGNETICS CP	9- 37	13 1/4	- 3/8	-2.7
O	HADCO CORP	5- 12	4 3/4	0	0.0
O	MICRO MASK INC	9- 18	8 1/2	0	0.0
N	TERADYNE	22- 39	22 3/4	-1 5/8	-6.6
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	2- 6	2 3/8	0	0.0
	ADVANCED SYSTEMS INC	9- 22	10 3/4	- 1/4	-2.2
O	AGS COMPUTERS INC	10- 22	13 1/4	-1 1/8	-7.8
O	AMERICAN SOFTWARE	12- 21	19 1/2	+ 1/2	+2.6
N	ANACOMP INC	2- 19	3 3/8	0	0.0
O	ANALYSTS INTL CORP	5- 17	8 1/4	- 1/2	-5.7
O	APPLIED DATA RES	16- 28	28 7/8	- 3/8	-1.2
O	ASHTON TATE	6- 15	8 1/2	0	0.0
O	ASK COMPUTER SYSTEMS	13- 24	20 3/4	-1 1/4	-5.6
O	[illegible] COMP IND	1- 7	2 1/8	+	+2.9
N	AUTOMATIC DATA PROC	30- 46	45 3/8	+1 5/8	+3.8
O	COMPUTER ASSOC INT'L	15- 29	25 3/4	- 3/4	-2.8
O	COMPUTER HORIZONS	8- 20	8 3/4	- 1/2	-5.4
O	COMPUTER NETWORK	5- 11	8	+ 1/8	+1.5
N	COMPUTER SCIENCES	11- 23	14 7/8	- 1/4	-1.6
O	COMPUTER TASK GROUP	12- 21	19 5/8	- 5/8	-3.0
O	COMPUTER USAGE	1- 18	1 1/8	0	0.0
O	COMPUTONE SYSTEMS	4- 23	9 1/8	- 7/8	-8.7
O	COMSERV CORP	3- 16	3 1/2	- 1/8	-3.4
O	COMSHARE	6- 14	8 1/2	+ 1/8	+1.4
N	CULLINET SOFTWARE	17- 33	28	+1 7/8	+7.1
O	CYCARE SYSTEMS INC	16- 27	23 1/2	-2	-7.8
O	[illegible] SYSTEM INC	6- 27	6	+ 1/4	+4.3
N	GENERAL ELECTRIC CO	45- 65	60	-2 3/8	-3.8
N	GTE CORP	36- 48	41 1/8	-1 7/8	-4.3
	INFORMATICS GENERAL	14- 22	17 7/8	- 7/8	-4.6
O	INFORMATION SCIENCE	4- 17	3 1/2	- 1/4	-6.6
O	INFOTRON SYSTEMS CP	15- 42	23 1/2	- 1/4	-1.0
O	KEANE ASSOCIATES	6- 15	13 3/4	+ 1/4	+1.8
N	LOGICON	18- 34	34	+ 3/4	+2.2
O	LOTUS DEVELOPMENT CP	15- 40	29 1/8	+2 3/8	+8.8
O	MCI COMMUNICATIONS	6- 28	8 3/4	- 1/8	-1.4
O	MGMT SCI AMER INC	9- 23	11 1/2	- 3/4	-6.1
O	MATHEMATICAL APP GRP	6- 18	6	0	0.0
O	MICOM SYSTEMS INC	27- 50	27 1/4	-2	-6.8
O	MICROPRO INTL CP	2- 10	2 7/8	0	0.0
O	NATIONAL DATA CORP	8- 26	10 1/4	0	0.0
O	ON-LINE SOFTWARE INT	4- 29	6 1/4	0	0.0
O	PANSOPHIC SYSTEMS	11- 30	18	-1 1/2	-7.6
N	PLANNING RESEARCH	10- [illegible]	11 3/8	- 3/4	-6.1
O	POLICY MGMT SYSTS CP	22- 35	26 3/4	-3 1/8	-10.6
O	PROGRAMMING & SYS	4- 8	5 3/8	+ 1/8	+2.3
O	REYNOLDS & REYNOLD	28- 52	37 1/4	- 1/4	-0.6
O	SEI CORP	11- 34	17 3/4	+1 1/4	+7.5
O	SHARED MEDICAL SYST	29- 43	29 7/8	- 3/8	-1.2
O	SCIENTIFIC COMPUTERS	5- 14	6 1/8	- 1/4	-3.9
O	SOFTWARE AG	9- 21	14 5/8	-2 3/8	-13.9
N	URS CORP	10- 18	10 3/8	- 3/4	-6.7
N	UCCEL	7- 17	13 3/4	- 1/8	-0.9
	PERIPHERALS & SUBSYSTEMS				
P	AM INTERNATIONAL	2- 7	4	- 5/8	-13.5
A	ANDERSON JACOBSON	3- 26	3 3/8	- 1/4	-6.8
O	AST RESEARCH INC	7- 20	18 5/8	+ 7/8	+4.9
O	AUTO-TROL TECHNOLOGY	8- 29	10 1/4	+ 1/4	+2.5
O	AVANT GARDE COMPUTING	11- 28	11 3/4	- 1/4	-2.0
O	BANCTEC INC	5- 22	10 1/2	- 1/4	-2.3
O	BEEHIVE INT'L	1- 7	1 1/8	0	0.0
N	BOLT,BERANEK & NEW	17- 30	26	- 5/8	-2.3
O	CAMBEX CORP	1- 3	1 5/8	- 1/8	-7.1
N	CENTRONICS DATA COMP	5- 26	4 3/4	- 7/8	-15.5
A	CETEC CORP	7- 12	6 3/4	- 1/2	-6.8
A	COGNITRONICS	4- 20	4 5/8	- 3/8	-7.5
N	COMPUGRAPHIC CORP	26- 40	31 1/4	- 7/8	-2.7
O	COMPUTER TRANSCEIVER	1- 10	1	0	0.0
N	COMPUTERVISION CORP	21- 53	20 5/8	- 3/8	-1.7
N	CONRAC CORP	11- 24	13 1/8	0	0.0
A	DATAPRODUCTS CORP	13- 32	13 1/8	-1 1/4	-6.6
A	DATARAM CORP	4- 12	6	- 1/4	-4.0
O	DATA SWITCH CORP	5- 41	5 7/8	0	0.0
O	DATUM INC	5- 17	7 1/2	- 1/4	-3.2
O	DECISION DATA COMPUT	9- 19	15 1/4	-1 1/8	-6.8
O	DOCUTEL-OLIVETTI	3- 39	5	+1 3/4	+53.8
N	ELECTRONIC M & M	5- 11	6 5/8	+1 1/8	+15.0
O	ENDATA, INC	5- 16	4 3/4	- 1/4	-5.0
O	EVANS & SUTHERLAND	11- 50	12 7/8	+ 1/8	+0.9
O	GANDALF TECHNOLOGIES	6- 14	8 1/4	0	0.0
N	GEN'L DATA COMM IND	10- 20	15 3/8	-2 1/4	-14.3
	HAZELTINE CORP	15- 33	25 3/8	+1 7/8	+7.6
O	ICOT CORP	3- 8	5	- 1/4	-4.7
O	INFORMATION INTL INC	10- 19	13 1/2	+ 3/8	+2.8
O	INTECOM INC	6- 21	5 5/8	-2	-26.2
O	INTEL CORP	25- 45	26 1/2	-1	-3.6
A	LUNDY ELECTRONICS	7- 19	12 1/2	- 1/4	-1.9
O	MEGADATA CORP	3- 8	5 3/4	- 1/4	-4.1
A	MSI DATA CORP	9- 25	9 1/2	- 1/2	-5.0
N	NASHUA CORP	19- 29	26	-1	-3.7
O	NETWORK SYSTEMS CORP	16- 34	25 1/2	-1 1/8	-4.2
N	NO AMERICAN PHILIPS	30- 45	38 7/8	-1 3/8	-3.4
N	NORTHERN TELECOM LTD	30- 49	35	-1 5/8	-4.4
O	OMEX	1- 6	1/8	0	0.0
N	PARADYNE CORP	11- 26	13 1/4	-1 1/8	-7.8
A	PENRIL CORP	9- 14	12 3/8	- 1/4	-1.9
N	PLESSEY CO (ADR)	20- 41	23 1/4	+1 1/4	+5.6
O	PRINTRONIX INC	13- 34	15 1/2	0	0.0
O	RAMTEK CORP	4- 23	4 5/8	- 1/2	-9.7
N	RECOGNITION EQUIP	10- 17	13 1/4	- 3/4	-5.3
N	SANDERS ASSOCIATES	32-120	36 1/2	-1	-2.6
O	SCAN TRON CORP	9- 19	12 7/8	- 3/8	-2.8
N	SCIENTIFIC ATLANTA	8- 23	10 3/4	- 5/8	-5.4
O	SEAGATE TECHNOLOGY	4- 20	6 3/4	- 7/8	-11.4
N	STORAGE TECHNOLOGY	2- 23	2 7/8	0	0.0
O	SYKES DATATRONICS	1- 13	1	-	-5.5
A	T BAR INC	7- 7	7 3/8	- 3/8	-4.8
A	TAB PRODUCTS CO	7- 20	8	- 1/8	-1.6
	[illegible] CORP	7- 25	[illegible]	- 3/8	-6.1
A	TEC INC	6- 12	10 1/2	- 3/4	-6.6
N	TEKTRONIX INC	52- 67	58	-1 1/2	-2.5
N	TELEX	15- 47	40 7/8	- 7/8	-2.0
O	TESDATA SYSTEMS CP	2- 7	1 3/4	0	0.0
N	TIMEPLEX INC	13- 23	17 1/8	0	0.0
O	VISUAL TECHNOLOGY	2- 26	1 7/8	0	0.0
	SUPPLIES & ACCESSORIES				
N	AMERICAN BUS PRODS	17- 25	25 1/8	- 1/8	-0.4
N	BARRY WRIGHT	21- 33	23 3/4	- 3/8	-1.5
A	DUPLEX PRODUCTS INC	22- 31	30	- 1/4	-0.8
N	ENNIS BUS. FORMS	18- 38	34 5/8	- 1/4	-0.7
N	3M COMPANY	69- 90	81 3/8	-1 3/4	-2.1
N	MOORE CORP LTD	45- 57	52 1/2	+ 1/4	+0.4
O	STANDARD REGISTER	27- 57	56 1/2	- 1/2	-0.8
N	WALLACE COMP SERVICE	23- 38	34 7/8	+ 1/8	+0.3

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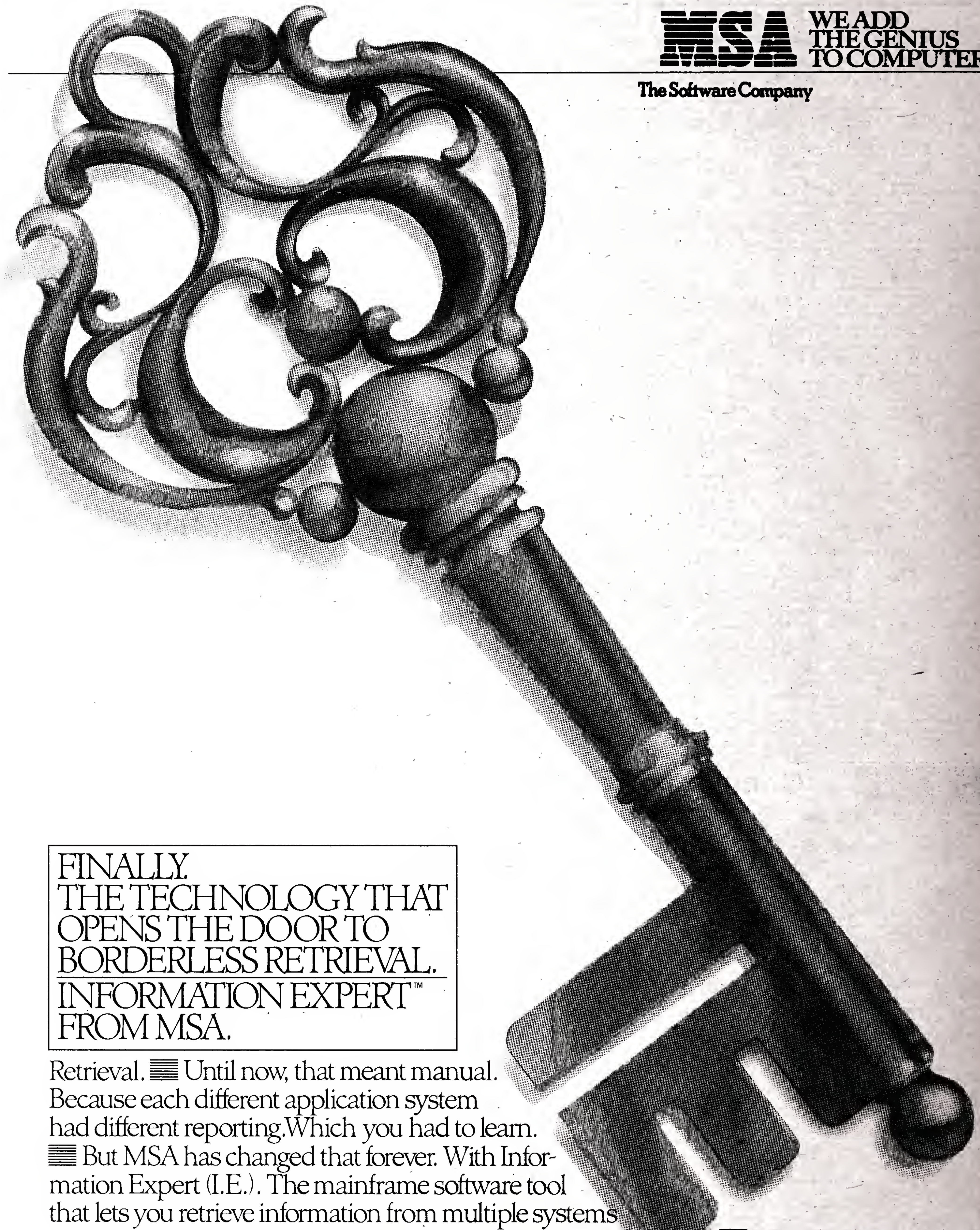

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